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II. *Monograph on the Anguillulidæ, or Free Nematoids, Marine, Land, and Fresh-water; with Descriptions of 100 New Species.* By H. Charlton Bastian, *M.A., M.B. Lond., F.L.S.*

(Plates IX.–XIII.)

Read December 1st, 1864.

Of the Helminths hitherto described, those belonging to the Nematode group far exceed in number of species the representatives of either the Trematode or the Cestode orders, and, as far as our present knowledge extends, they have also a wider distribution as parasites amongst the various members of the animal kingdom. Thus, commencing with the *Acalephæ*, we find the so-called *Nematoideum Cydippes* taking up its residence in the substance of the body of one of our smaller jelly-fish, and thence onwards through higher and diverse types of animal life they are found, in more or less plurality, infesting representatives of all the principal orders and classes, till we come to man himself, who is the chosen habitat of no less than twelve species. Happily, however, whilst thus numerous and widely diffused, their effects are less pernicious and more seldom fatal than those resulting from the presence of individuals of the Trematode or Cestode types in their various stages of development [1].

As regards the actual number of parasitic Nematoids at present known, it has been computed by Dr. Cobbold, in his recent work on 'Entozoa,' that these do not amount to more than about 550 distinct species; and when I mention that within a space of fifteen months I have obtained from a few limited regions no less than 100 new species of free Nematoids, some idea may be formed of the numerical importance of this last group, concerning which, till within quite a recent period, our knowledge has been so vague and unsatisfactory.

Borellus[2], more than two centuries ago, seems to have been the first to recognize and describe a member of this family; and we must look, therefore, upon the so-called "Vinegar Eel," whose discovery he announced, as the first known representative of this group of non-parasitic Nematoids to which I refer. The same animal was subsequently seen by Power, Hooke, Leeuwenhoek, Baker, Spallanzani, and other pioneers of microscopical research, who soon found a companion for it in its near ally, the "Paste Eel." Then came the discovery by Needham[3], in 1743, of the wonderful *Vibrio tritici* and its young so strangely tenacious of life; and afterwards Otto Müller[4] was followed in his recognition of

As exceptions to this general rule, three Nematoids may be cited which are undoubtedly most serious pests to the human race, from the frequency of their occurrence and the serious diseases to which they give rise: these are the Guinea Worm, which is so prevalent in the tropical parts of Asia and Africa; *Sclerostomum duodenale*, principally met with in Egypt, and so common that Dr. Griesinger considers about one-fourth of the whole population suffer more or less from "Egyptian chlorosis" (a malady that is frequently fatal), due to the presence of these parasites in the situation indicated by its name; and, lastly, *Trichina spiralis*, which has attracted so much attention of late, owing to the frequency of trichinosis, in various parts of Germany more especially.

[2] Obs. microscop. Centur. 7, 1656. [3] Micr. 99, tab. v. 7. [4] Animal. Infusoria. 4to. Hamb. 1786.

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certain minute microscopic Nematoids found in fresh or salt water, and amongst Confervæ, by other naturalists, the principal of whom are Bory [1], Steinbuch [2], Dugès [3], Ehrenberg and Hemprich [4], Nordmann [5], Dujardin [6], Oken [7], Quatrefages [8], Grube and Leuckart [9], Diesing [10], Max Schultze [11], Leidy [12], Kühn [13], Carter [14], and Eberth [15]. The labours, in this direction, of these scientific observers have resulted in the discovery of about eighty species of free Nematodes found in various parts of the world. It is, however, to the researches of Dujardin, Eberth, Carter, and Diesing that we have been principally indebted for our knowledge of this group. Dujardin was the first who seemed to entertain comprehensive notions as to the extent and probable diffusion of these animals, and, besides the discovery of several new species, added more precise descriptions of them than the extremely scant details concerning the anatomy of the earlier forms furnished by Otto Müller, Ehrenberg, Hemprich [16], and others. Carter, besides the discovery of ten new species, has contributed many interesting anatomical details; and Eberth, in his recent valuable memoir [17], has added much to our knowledge of their anatomy, in addition to the descriptions and beautiful figures which he has given of twenty-three new species; though he, like his predecessors, has tended to create great confusion in the nomenclature, by describing under the same generic name species differing notably in the anatomical arrangement of important parts, as I shall hereafter endeavour to explain. It is by his writings, rather than by special anatomical examinations of his own, that Diesing's name is associated with this group, since he has not only treated of them in his 'Systema,' but also has lately made the classification of the Nematodes, both free and parasitic, the subject of a special communication [18].

The writings of Carter afforded the stimulus which induced me to inquire into this subject; for, like himself, having been interested in the anatomy of the *Dracunculus* [19], my attention was arrested by his interesting paper on the "Microscopic Filaridæ in the Island of Bombay" [20], and my search for similar free Nematoids in this country has been

[1] Encycl. Méth. 1824, p. 777, tab. iv. f. 20–23. [2] Naturforsch. xxviii. St. 233, tab. v.

[3] Ann. des Sc. naturelles, 1826, tom. ix. p. 225. [4] Symb. Phys., seu Icones et Descrip. Animal. evert. 1828.

[5] Lamarck's Hist. Nat. des Ann. sans vert. 1840, tom. iii. p. 665.

[6] Hist. Nat. des Helminthes (Suites à Buffon), 1845, p. 230. [7] Lehrb. d. Naturg. Zool. 1. Abtheil. p. 192.

[8] Ann. des Sciences Nat. 1846, p. 131. [9] Wiegmann, Archiv, 1849, Band i. pp. 157, 358.

[10] Systema Helminthum. Vindobonæ, 1851, vol. ii. p. 122. [11] Icones Zootomicæ, Carus, tab. viii. figs. 1–3.

[12] Journ. of Acad. of Nat. Sc. of Philadelphia, vol. iii. (1856) pp. 135–152 (2 plates).

[13] Zeitsch. für wissen. Zool. 1857, t. ix. p. 189. [14] Ann. of Nat. Hist. 1859, vol. iv. pp. 28 and 98, pls. 1–3.

[15] Untersuch. über Nematoden, mit neun Kupfertafeln. Leipzig, 1863.

[16] Any attempt to recognize the species of these authors seems quite hopeless, since, oftentimes, no other anatomical details are given, save the mere length and breadth, and for figure, if any, only a mere outline form—occasionally a simple white space on a black ground.

[17] My species were already found, drawings made, and a rough draft of this paper written before I was made aware of the researches of Dr. Eberth upon the same subject, by the sight (November 1864) of his admirable monograph. I find he has anticipated me in a few of the anatomical facts which I had worked out independently; the coincidence, however, cannot but be satisfactory in a field beset with so many conflicting statements of different observers.

[18] Sitzungsberichte der Wiener Akademie, 1861, Bd. xlii. no. 28, p. 612.

[19] Transactions of the Linnean Society, vol. xxiv. part 2, p. 101. [20] *Loc. cit.*

rewarded by the most gratifying results—more especially as, with the exception of the "Paste" and "Vinegar Eels," the *Vibrio tritici*, and one or two unknown species always alluded to by the same name of *Anguillula fluviatilis*, no representatives of this group have, I believe, yet been described as existing in Great Britain: hitherto the harvest has been with the continental naturalists, with Dr. Leidy in America, and with our own countryman Carter in India.

As a result of my investigations, I am inclined to believe that these free Nematodes will be found to constitute one of the most widely diffused and numerically abundant groups in the whole animal kingdom, rivalling, in the first respect at least, the almost ubiquitous Diatomaceæ. A statement of some of the principal situations in which I have met with these animals will best illustrate this proposition. Thus, beginning with the land- and freshwater-species, I have found them in all the specimens of soil examined, in moss, various species of lichen, about the roots of fungi[1], also the roots of grasses, and between the sheaths of their leaves, amongst the mud of ponds and rivers, on the fresh-water Algæ, amidst decaying liverworts and mosses, and on submerged aquatic plants. The marine species exist in great abundance in the surface-mud of rivers and estuaries[2], in the sand, and amongst the small stony débris under the shelter of rocks, as well as in the tide-pools, where they swarm about the roots of the corallines and on some of the smaller and finer sea-weeds, especially those having a dingy appearance from the presence of Diatomaceæ. And, lastly, two or three species I have found in the greatest abundance, as pseudo-parasites, within the substance of some of the softer sponges. So numerous are they in these latter situations, that it is rather surprising they should have so long escaped the attention of marine zoologists. From the transparency of their integuments, they are not only beautiful microscopical objects, but also admirably adapted for anatomical research; and Dr. Eberth and myself have already worked out so many interesting structural details, that I have no doubt, should the investigation be followed up by other observers, the question of the anatomy and real affinities of the Nematoids, at present so doubtful, would be soon placed upon a satisfactory footing.

The specimens I have examined have varied in length from $\frac{1}{70}''$ to nearly $\frac{3}{4}''$, almost all the larger forms being marine, though *Dorylaimus stagnalis*, Dujard., is about $\frac{1}{3}''$ long, and far exceeds in size any of the other land or freshwater species I have met with. In their various habitats individuals of all ages may be seen, from the young, immature and non-sexual embryo just emerged from the egg or its parent, up to the adult condition; and frequently the ova of species infesting a particular sea-weed may be seen attached to it, whilst the parent worms are gliding and twining, serpent-like, amongst its branches. This fact alone would induce one to believe that these animals are never parasites at any stage of their existence, even if this view were not confirmed by the existence of anatomical peculiarities which seem to distinguish them as a group from the parasitic forms

[1] I have not been very successful in finding these animals on or in fungi, though Carter has discovered them in abundance at Bombay projecting from the conceptacles of a large species of the genus *Xylaria*, growing on the decayed trunk of a tamarind-tree. (Trans. of Med. and Phys. Soc. of Bombay, 1861, App. p. 1.)

[2] I have found six different species existing, more or less abundantly, in a small portion of mud that could be held on a shilling piece.

in general. Since, however, the announcement of the discovery of so many free Nematoids is likely to suggest to the minds of many the belief that these are identical with the parasites, being merely the revelation of another stage of their life-history, which has hitherto been hidden from us, it seems desirable to bring forward some evidence to disprove such a supposition, and establish the claim of these minute creatures to a distinct and independent place in the animal kingdom—and more especially so since precisely such a view has been taken by one of the principal writers on these free Nematodes. For, at the conclusion of his paper before mentioned, Carter, speaking of the uncertainty still existing with regard to the early history of the *Dracunculus*, adds, "It remains a subject for future and interesting inquiry, but not more so than the still further elucidation of the Filaridæ generally, both free and parasitic; for when we consider that the former abound in species, and are spread in myriads probably all over the world, where there is vegetable matter for them to feed upon, in salt as well as in fresh water, in the sea and on the land, while the latter inhabit all animals, perhaps, more or less, down to the lowest worms; that many of the former[1] leave their habitat and vegetable food for a temporary residence in animals, to live thus on animal food, and that therefore *the whole of the parasitic forms may be originally derived from the free ones*"; for these, and other reasons, he says, "these worms, at first apparently insignificant from their thread-like form and scarcity, are seen to assume an importance in organic creation which calls for a much more extended study of them than they have as yet received" (p. 112).

With the view of investigating this question, I made a careful analysis of the anatomical details and plates given by Dujardin, in his 'Histoire naturelle des Helminthes,' of the Nematoid Entozoa,—selecting this writer, not only on account of the more complete descriptions found in his work, but also in deference to his extensive practical acquaintance with this particular branch of his subject. The result of this examination has sufficed to convince me that the nearly constant combination of several important characters—so universal as to be typical of these free Nematodes—are only *probably* present in two or perhaps three of the parasitic genera. These distinct characters are furnished by the male and female genital organs,—the males having two equal subterminal intromittent spicules, with or without accessory pieces, whilst the females have the vulva situated at about the middle of the body, a short vagina, with a symmetrical double uterus, whose branches lie on opposite sides and are connected with a short and simple reflexed ovarian tube—the only exception to this arrangement being in a few genera, in which, the females having the vulva situated some way behind the middle of the body (about the commencement of the posterior third), the hinder segment of the uterus remains abortive and undeveloped (Pl. X. fig. 113), whilst the anterior segment retains its characteristic form.

On referring to Dujardin's classification[2], it will be seen that he has ranged the Nematoids into seven sections, together with an appendix containing the little-known or anomalous forms. The anatomy of the animals included in his first section, comprising the genera *Trichocephalus* and *Trichosoma*, is totally distinct as regards the arrangement

[1] Not strictly speaking Nematoids; the animals referred to, constituting the genera *Gordius* and *Mermis*, belong in reality to a nearly allied order, *Gordiacea*.—H. C. B.

[2] *Loc. cit.* p. 2.

of the genital organs from that above mentioned; those of his second, including *Filaria*, *Spiroptera*, &c., are distinguished "par la présence de deux organes copulatoires, ou pénis, *inégaux*," whilst of his third section, containing the genera *Strongylus*, *Leptodera*, *Dicelis*, &c., the members of which do possess two equal spicules, with or without accessory pieces, the genus *Leptodera* is the only one affording also the character of a uterus divided into two equal and opposite branches, with the vulva occupying a median position. This genus contains one species[1], the *L. flexilis*, found in the vas deferens of *Limax cinereus*. In his fourth section, comprising the *Ascarides*, the members of the second subgenus, *Ascaridia*, including several species found in the intestines of birds, comply with the requirements so far as the male intromittent organs and double uterus are concerned, but differ by the presence of the three prominent cephalic lobes and the filiform ovaries characteristic of the genus *Ascaris*. In his fifth group, Dujardin places these free Nematodes together with certain other genera. The sixth section, containing *Sclerostoma*, *Syngamus*, &c., contains only one genus, *Angiostomum*, having the beforementioned arrangement of the male and female sexual organs; but the figures given by Dujardin of the only two species of this genus—one found in the lungs of *Anguis fragilis*[2], and the other in the intestine of a pulmonate Gasteropod—seem to indicate a totally different formation of the ovarian tubes. The individuals of the seventh and last section, including the genera *Dacnitis*, *Ophiostoma*, &c., are out of the question, from their not possessing a terminal mouth; and those of the appendix do not comply with other conditions[3].

This evidence seems a sufficient warrant for the belief in the non-parasitic nature of the animals in question, since it could scarcely happen, if these forms were ever parasitic, that they should not some of them—or, at all events, species of the same genera—have been met with in this condition, so as to enable us to include in the same genus parasitic and non-parasitic types. To me, indeed, it seems clear that these free Nematoids themselves, which can be detected in all stages of growth in external media, are not likely, as a rule, to be capable of existing also as parasites. Then comes the question, are they as a group distinguished by any particular characters from the parasitic forms? To which I think we are fairly entitled to return an answer in the affirmative, after the statements that have just been made, and from a consideration of other facts to be presently mentioned[4]. So far, too, this is in accordance with the views held by the

[1] Another and much larger species has since been found by Dr. Baird in the abdominal cavity of *Siredon mexicanus* (Proc. Zool. Soc. 1858, p. 225, (Annulosa) pl. 52. f. 6, 7.

[2] This species, *Angiostomum entomelas*, I have lately discovered, and have satisfied myself, not only that it does not belong to any of the genera of free Nematodes at present known, but that it is distinguished from the members of this group generally by the form of its ovaries and the extreme thinness of its integument.

[3] The genus *Odontobius* being the only one concerning which there is any doubt, the nature of which will be explained in the systematic portion of this memoir.

[4] It is true that a few of these free Nematodes have been found within the intestines of other animals by Dujardin; but in all the cases related by him, their presence within the intestinal canal may be looked upon as accidental rather than necessary, they having been swallowed, as he suggests, by these animals either with or as food. Thus *Dorylaimus stagnalis* was found by him in the intestine of the Carp. He has found species of the genus *Rhabditis* within the intestine of small slugs and of the common Frog (which, in its turn, swallows the slug), as well as in the stomach of several fishes, and the general cavity of the body of the Earth-worm. It would be desirable to have additional obser-

leading helminthologists of the present day, who are almost all now disposed to believe that the parasitic Nematoids exist in an asexual condition within the body of an intermediate host, before host and guest are swallowed by those animals destined to harbour the sexually mature Entozoa—the conditions essential to their development seeming to necessitate this intermediate state, instead of that direct and continuous method of evolution from the egg to the adult animal which I have recognized in all the free Nematodes in their various habitats. Our knowledge of the life-history of the parasites is extremely defective; but what we do know concerning the so-called *Filaria piscium*, *Trichina spiralis*, and other immature Nematodes is confirmatory of this belief. Moreover, in his recent work on "Entozoa," Dr. Cobbold, speaking of the Ascarides, remarks, "In all situations where there is an abundant water-supply these parasites are more particularly common; and it is well known that the lowlands of Holland and the lake districts of Sweden are eminently favourable to their existence. All this is explicable enough from what we now know respecting the conditions which are essential for the rearing of the larvæ; but, as I have before observed, it is almost certain that the human body becomes infested, not by the drinking of water which may contain the sexually immature embryos, but by feeding upon the flesh of some quadruped, fish, or fowl which happens to represent the so-called intermediate host" (p. 313).

Some additional points in the anatomy of the members of this group, to which I will briefly allude, seem to strengthen the view I have been endeavouring to enforce. In the first place, the integuments have a greater proportional thickness than in the recognized parasitic forms; and in the next, there is a marked difference in the number of ova or young produced: whilst the entozoid species are most prolific, furnishing offspring by hundreds, thousands, or even millions, in these free Nematoids the ova are relatively very large and few in number, being easily countable, and, for the most part, seen in single

vations concerning the animals found in this last habitat, before we can be certain that they belong to any of the genera of free Nematoids, since it is perfectly certain that in his genus *Rhabditis* Dujardin includes many and most diverse types. Speaking of these Nematoids and the Earth-worm, he says, "Je l'ai vu plusieurs fois, soit à Paris, soit à Rennes, se développer en quantité prodigieuse, et former des amas blanchâtres dans des vases où j'avais conservé des lombrics avec de la mousse et de la terre humide." Moreover it appears from the interesting experiments of Davaine ('Recherches sur l'Anguillule du blé niellé,' Paris, 1857, p. 64) upon the young of the *Vibrio tritici*, that their chitinous integument effectually protects them from injury within the alimentary canal of the cold-blooded animals. This was ascertained by experiments upon the Frog, the Triton, the Salamander, and a fish (*Cyprinus auratus*) belonging to the same genus as that in which the *Dorylaimi* were found by Dujardin. Davaine says, "Ingérées dans l'estomac de ces animaux, soit sèches, soit humides et vivantes, les anguillules de la nielle ont parcouru tout le tube digestif, sans avoir subi d'altération; elles ont été évacuées ou retrouvées dans le rectum, privées de mouvements, mais non de la vie, dont elles n'ont par tardé à reprendre les manifestations, après avoir été placées dans l'eau pure." This seems to afford a very probable explanation of the accidental presence of these free Nematodes uninjured within the *alimentary canals* of certain of the lower animals, though it does not at all account for their presence within the general cavity of the body of the earth-worm, as reported by Dujardin, or of *Naïs albida*, as related by Carter. It should be remembered, however, that the general cavity of the body in these animals is not a shut sac, since it communicates with the exterior by means of certain ciliated tubes, called by Dr. Williams (Phil. Trans. 1858, p. 93) "segmental organs.". In these tubes of the earthworm a parasitic Nematoid (*Dicelis filaria*, Duj.), is known to exist in great abundance. The young of this animal might work their way through the patent terminations of the tubes into the abdominal cavity of their host; and it is even possible that minute free Nematoids might also work their way inwards, through these tubes, into the abdominal cavity of both *Naïs* and Earthworm.

file within the genital tubes, though often occupying the whole width of the body. This is a condition of things quite in harmony with the several requirements of animals dependent upon such totally different conditions. The free Nematodes produce their ova or young at once in that environment which they are destined to inhabit, whereas the parasitic progeny are subjected to a multiplicity of chances and contingencies before they meet with the necessary conditions suitable for their development: there must be many blanks in order to ensure a few prizes. It is but another instance of the harmony subsisting between the observed biological history of an organized being and the physical conditions to which it is subjected and surrounded; and the difference in this respect between the two divisions of the order *Nematoidea* may not inaptly be compared to that existing between the predaceous cartilaginous fishes, on the one hand, and the ordinary osseous species on the other. We may note the same limited number of progeny in those forms whose young are most likely to survive, owing to their being produced viviparously or else with the egg enclosed in a coriaceous envelope, which, for additional security, becomes fixed by means of its tendrils to some rock or larger seaweed. Whilst the ova or young of such species may be numbered by units, for those of the majority of osseous fishes we may substitute, instead of units, millions or even billions.

Then many of the free Nematoids, more especially of the marine species, are provided with such rudimentary sense-organs as would be useless to a parasite. These exist in the form of distinct, reddish, conical and circumscribed masses of pigment, with the addition occasionally of transparent lens-like bodies, situated on the anterior part of the œsophagus, which doubtless subserve the purpose of rudimentary visual organs. And, lastly, almost all the free Nematodes are furnished with a caudal sucker, most highly developed in the marine species, to whom its utility is obvious, by enabling their smooth and polished bodies to adhere to the particular weeds which they infest, whilst these are swayed to and fro by the currents of the flowing and receding tide.

These various considerations lead me to believe that the free Nematoids constitute a group absolutely distinct from the parasitic forms; and I have dwelt upon this point, not only because it has not been enforced by previous writers, but also with the view of showing the untenability of the opposite hypothesis, advanced, perhaps somewhat hastily, by a most accurate observer, and one whose opinions generally are so worthy of credit. On this account, too, it does not seem to me desirable to associate with these animals, as Dujardin has done in his fifth section, "Enopliens," the two parasitic genera, *Passalurus* and *Atractis*—and this not simply on the arbitrary ground of their being parasitic, but because they neither of them comply with those structural conditions which were stated to obtain almost universally in the group in question. They appear to have been so placed by Dujardin, from the simple fact of their possessing a mouth armed with three teeth or jaws, which he took to be the typical character of this group, as shown by the name he applied to them. But a reference to the figures and descriptions of the species discovered by Dr. Eberth and myself will show that this is a structure quite exceptional —only met with in one or two genera, and therefore untenable as a family distinction. Diesing, also, in his recent communication on the classification of the Nematoids, has associated with these animals certain parasitic genera; and in this paper, as well as in his

'Systema,' under Ehrenberg's genus *Anguillula* (which is characterized in such general terms as to be perfectly capable of including the most diverse types) he places several species of minute Nematodes found in the intestines of insects, myriapods, and other animals, which were, for the most part, named by their original discoverers either *Ascarides* or *Oxyurides*. An examination of the extremely imperfect descriptions given by him, as well as of the figures by their original discoverers[1], seem rather to confirm the former position assigned to them; and from a consideration of the facts before mentioned, I certainly should not be disposed to place in the same genus parasitic and non-parasitic forms without more distinct evidence of their identity in anatomical details than we at present possess[2].

Since the classification of the Nematoids generally is in such a confessedly unsatisfactory condition, it is quite impossible to indicate the precise position or affinities of these non-parasitic forms. It seems, however, most desirable to retain for this group the family name of Anguillulidæ, proposed by Gervais and Van Beneden[3], which is not only generally suitable, but is also recommended by the fact of the most familiar and first-discovered species having still retained for them the generic name of *Anguillula*.

In the description of species and genera, and the arrangement of the former into the latter groups, an extreme amount of confusion prevails concerning almost all the forms hitherto discovered. This seems to have arisen partly from the meagre descriptions and indefinite figures given, and partly, with more accurate and precise observers such as Eberth, from their not having definitely settled what should be looked upon as points of generic importance. Some of this confusion I hope to be able to clear up in the more special portion of this memoir, and also to indicate, as far as my observation has extended, the value of different anatomical peculiarities as guides to classification.

Having thus sketched the history of our knowledge concerning this group of animals, I will now add a few details regarding their structure, habits, and mode of life. I shall merely give a brief outline, however, of their anatomy, as I intend to make this the subject of another communication.

The *integument* is mostly very transparent and hyaline in appearance, of a chitinous composition, and presenting sometimes transverse lines or dots, at others longitudinal markings[4], either alone or with transverse also; whilst in the remainder the integument appears perfectly plain, with no striæ of any kind. I have discovered numerous fine capillary canals through the integument, establishing a communication, apparently, between the exterior element and the peculiar lateral and median lines of these animals. These minute channels vary much in their number and arrangement in different genera, and promise to throw considerable light upon the nature of the curious lateral

[1] For references, see Diesing's 'Syst. Helminth.' vol. ii. pp. 132–136.

[2] Diesing's *Anguillula macrura* I have lately found in the intestines of *Blatta orientalis*, and have ascertained that it has no resemblance to any of the free Nematodes at present known. Its anatomical characters are totally distinct from those of *Anguillula aceti*; and it seems best to place it in a distinct genus (*Streptostoma*), as was done by Dr. Leidy (Smithson. Cont. 1853, v. p. 46, tab. 7. f. 6, 7).

[3] Zoologie Médicale.

[4] These must not be confounded with the longitudinal muscular bundles seen through an unstriated integument.

lines which have so long been a puzzle to anatomists. I have also detected these cutaneous pores in several of the parasitic Nematoids. In many species the integument is provided with setæ around the head, and more sparingly on other parts of the body; occasionally it is developed into papillæ around the mouth; and, besides the caudal sucker before alluded to, many of the males are furnished with a varying number of ventral suckers. Ehrenberg records the fact of his having observed *Anguillula recticauda* cast its skin. I have seen evidences of the same thing in many species, and suspect that, during the period of growth of the free Nematodes, it is the rule. In some few species, the integument appears to be glutinous. Thus *Oncholaimus vulgaris*, from marine mud, has always adhering to its surface minute particles of sand and *Diatomaceæ*, and in one case I saw two or three *Vorticellæ*. In *Spira parasitifera* I have frequently found specimens of a stalked fan-shaped diatom, probably belonging to the genus *Echinella*, as well as *Vorticellæ*, attached to the integument. Some few species, too, of the genus *Chromadora*, from marine mud, have been found enclosed in a tube like that of the *Sabella*, composed of agglutinated sand-particles.

The *alimentary canal* commences wih a terminal rounded mouth, either opening into a dilated pharyngeal cavity or communicating at once with the œsophagus. This latter is often distinctly muscular, and has sometimes a pretty equal calibre throughout, whilst at others it is provided with one or two rounded or oval muscular swellings. The posterior one is occasionally provided with a few horny plates in its centre, and has generally been described as a stomach, though, I think, erroneously, since it seems to perform none of the functions of a stomach: it is not a receptacle for food, and the swelling is due to an increased muscularity of the walls of the œsophagus at this point, rather than to a dilatation of its central cavity. The structure seems to me to partake more of the nature of a valvular apparatus, partly facilitating the swallowing of food, and partly preventing the regurgitation of the freely moving and fluid contents of the intestine proper, during the rapid movements of the animal. This œsophagus is divided by a well-marked constriction from the intestine, which continues nearly uniform in size throughout the remainder of its course, terminating by a curved anal cleft on the ventral surface of the body at a variable distance from the posterior extremity. It is made up of a central tube and a mesenteric envelope, between which is situated a uniform layer of cells, containing light or olive-coloured fat-particles, probably having a rudimentary hepatic function. The arrangement of these cells and their contained granules is sometimes so regular as to give a distinctly tessellated appearance to the structure; whilst, at others, the intestine merely appears covered with a layer of irregularly disposed fat-particles, the containing cells being invisible, and their contained particles not definitely aggregated.

Some of the free Nematodes are viviparous; but, as before stated, most are oviparous, the ova being large and proportionally few in number. In many species they are so large as singly to distend the body; and in *Leptosomatum figuratum* I have measured one of this character of an elongated oval form, whose length was three times the breadth of the parent body. In *Dorylaimus stagnalis*, Dujardin, however, they are much smaller, admitting two or even three abreast within the uterus. In most of the

genera the uterus and ovaries are formed upon the same type; and in those exceptional cases where the posterior segment remains undeveloped, it may still be seen in a rudimentary condition in the genus *Tylelenchus* (Pl. X. fig. 113), whilst in others little or no trace of it can be recognized in the adult animal. The male organs consist usually of a long tube proceeding from the junction of two elongated sacs or testicles, which occupies the ventral aspect of the body, and terminates at the anal cleft, or, as in *Monhystera ambigua* and *M. disjuncta* (Pl. IX. figs. 12, 13), a little anterior to it. In two species, *M. ambigua* and *Diplogaster filiformis*, I have failed to detect any horny intromittent spicules, whilst in the remainder I have always found two equal spicules, either alone or with one, two, or four accessory pieces.

The *glandular* and *water-vascular* systems are so intimately connected with one another, that it seems best to include in the same notice what little I have ascertained concerning their relations. The whole inner surface of the body is lined by a glandular substance, more highly developed in some species than in others, similar to what I described in the Guinea-worm, and to what has been met with in some of the parasitic Nematoids by Eberth and other observers. In addition, in several species there are one or two pyriform glandular masses connected with the vagina (Pl. XI. fig. 117; Pl. XIII. figs. 189, 192), and also others near the anal cleft (Pl. XI. fig. 113; Pl. XIII. fig. 226), which have already been observed by Eberth, and termed by him "vaginal" and "anal glands" respectively. He has also described and figured two or three elongated sacs proceeding from the posterior extremity of the body, and has termed them tail-glands (Schwanzdrüsen): these I had observed also, but, from the fact of their being most developed in those species in which the caudal sucker is largest, and from their not presenting the usual granular appearance of the other unmistakeable glands, I have always looked upon them rather as contractile sacs in some way connected with the operation of the sucker, and shall speak of them henceforth as *sucker-tubes* (Pl. XI. figs. 126, 151). In nearly all the marine species, I have recognized a glandular excretory organ, opening by means of a long duct on the abdominal aspect of the œsophageal portion of the body (Pl. XI. fig. 151; Pl. XII. fig. 164), but have found no structure precisely answering to this in the land and freshwater species, though in four of these genera, *Tylelenchus*, *Plectus*, *Aphelenchus*, and *Cephalobus*—the members of which all possess the same remarkable tenacity of life—a modification of the same organ evidently exists. In these genera I have failed hitherto to detect the entire structure, and have only succeeded in recognizing the curved, more slender, and rigid duct with which it terminates (Pl. X. figs. 79, 97, 104, 112). Two lateral cellular canals, essentially similar to the peculiar fat-canals or lateral lines of the parasitic Nematoids, are met with, well developed, in many species, between which and the external medium I have been enabled to detect numerous communications by means of a variable number of integumental pores[1]. In three of the four land and freshwater genera above mentioned I have

[1] These pores seem evidently to have been recognized by Eberth at the anterior and posterior extremities of his *Phanoderma bacillatum*, though he put a totally different interpretation upon the appearances he observed, since he considers and speaks of them as skin-glands (*Hautdrüsen*), *loc. cit.* p. 6.

detected, instead of these canals, two lateral, double-outlined, colourless vessels, somewhat similar to what I described in *Dracunculus*[1], and which are most apparent in *Tylelenchus tritici*. In this species, from their being longer than the body, they are wavy or even convoluted, and I have several times succeeded in isolating them completely from other structures[2]. These seem to correspond to the axial vessels contained within the lateral lines[3] of *Ascaris lumbricoides*, *A. megalocephala*, and other parasitic Nematoids.

I have met with no distinct traces of a *nervous* system in these animals, the only thing which might be at all mistaken for a portion of such a system being the peculiar ring (also observed by Eberth) surrounding the œsophagus in some of the marine genera[4], concerning the nature of which we have both arrived, independently, at the same conclusion, that its connexions and structural peculiarities rather point to its affinity with the glandular than the nervous system (Pl. XI. fig. 12G). The absence of any traces of nervous filaments in connexion with the well-developed ocelli of so many of the marine species affords also strong negative evidence of the absence of such a system in the Nematoids.

The *muscles* of the body seem to be, the same as in other Nematodes, composed of four longitudinal bundles, two dorsal and two ventral, with an interspace on either side. In neither free nor parasitic have I been able to recognize the circular fibres spoken of by some anatomists.

Much difference exists as to the muscular power and activity of different species. The *Dorylaimi* and *Tylelenchi*, for instance, are very slow and tardy in their movements; *Sphærolaimus hirsutus* is remarkable both for its activity and power; whilst the different species of the genera *Theristus* and *Tachyhodites* are distinguished by rapidity of movement. The mode of locomotion of all is indeed most characteristic, being effected by eel-like undulations of the body, which at once distinguish these animals from the *Naï-*

[1] Linn. Trans. vol. xxiv. p. 113, pl. 21. fig. 26 *b*.

[2] Although not yet detected, I have little doubt that similar vessels will be found to exist in the fourth and nearly allied genus *Cephalobus*.

[3] Since this paper was read, I have ascertained that not only the lateral lines, but also the mid ventral and dorsal lines of the two *Ascarides* above mentioned are only local developments in these situations of a fibro-cellular layer lining the whole internal surface of the chitinous integument, and separating it from the four great longitudinal muscles. These developments (occupying the muscular interspaces) differ notably from one another, inasmuch as those in the lateral regions, besides being much larger and more prominent than the dorsal and ventral cords, contain each a well-marked axial vessel. Whether this vessel exists in all the Nematoids seems very doubtful, as in some of the parasitic, and in nearly all the free species, in which the lateral lines can be detected, they appear to be simple aggregations of large cells, bounded, internally at least, by a limiting membrane—though I think we may fairly look upon these lateral lines of the free Nematoids as homologous with the lateral lines of the *Ascarides*, and consequently infer that they are also integral parts of a general subcutaneous cellular layer. In this cellular layer of *A. lumbricoides* and *A. megalocephala* I have also detected a series of delicate transverse vessels, mostly in pairs, extending from the mid dorsal to the mid ventral line, and much more numerous on the right than on the left side of the body. These, I fancy, open externally by means of minute pores through the integument, though hitherto I have been unable thoroughly to satisfy myself of the fact.

[4] As yet I have only met with it distinctly in some of the marine genera, and, curiously enough, in those species only which have a plane or longitudinally striated integument, and never in those with transverse markings.

dinæ, with whom they are frequently associated, and also from the Annelids generally. Other movements of the aquatic species may be well seen if these animals are placed in a watch-glass and examined by a low power of the microscope, when they may be observed twining amongst the branches of the aquatic plants or algæ which they frequent, their gliding movements suggesting a resemblance to tiny serpents, till the delusion is banished by a sudden change in their method of proceeding, when, anchoring themselves firmly by means of their caudal sucker, they continue for some minutes swaying about with the greatest rapidity, darting their bodies hither and thither, and bending in all directions.

With respect to food, the free Nematodes seem to be almost exclusively vegetable feeders, though it is not often easy to recognize anything definite within their alimentary canal—the usual contents being a kind of granular débris, and in several species large oil-globules. In individuals of the genera *Cyatholaimus* and *Spilophora*, however, I have frequently seen the intestine filled with large Diatomaceæ, whilst in species of other genera I have occasionally made out a few cells of algæ. The quantity of large fat-globules often seen within the intestinal canal is remarkable, and also interesting in a physiological point of view, as an exemplification of the almost direct conversion of cellulose into fat and other products. In *Dorylaimus stagnalis* these large beads of fat are generally of a bright yellow, whilst in other species I have occasionally found them of a pure emerald-green colour, and in one instance even of a distinct magenta hue; but in the majority of species the fat is colourless. I have never yet seen one of these animals swallow a particle of food; but what they do take appears to remain a long time within the intestinal canal, becoming slowly and almost entirely metamorphosed into fat, as the primary stage of assimilation. In this respect they differ notably from the *Naïdinæ*, with which they are usually associated in both fresh- and salt-water mud; for with these, as with their near ally the Earthworm, the intestinal canal may be considered as little else than a highway road along which extraneous matter, containing organic particles, is continually passing. These latter animals are less fastidious in their appetites, swallowing at random, and appropriating the organic material only when within the alimentary tube; whilst the Nematodes are selective from the first, taking nothing but such vegetable substances as constitute their particular food. Their powers of prehension seem very limited; and I believe, from what I have seen, that their food is taken partly by suction, this being effected by the sudden dilatation of the otherwise habitually closed triquetrous canal of the œsophagus, by means of the radiating transverse muscular fibres of which its walls are composed. This rapid dilatation causes an inrush of fluid, with any particles that may be in front of the mouth; and I have several times observed air-bubbles and fluid enter and pass along the œsophagus in this way. How or of what nature is the food taken by individuals of the genera *Dorylaimus*, *Tylelenchus*, and *Cephalobus*, having a sharp, exsertile, spear-like commencement of the œsophagus, I cannot say: it seems difficult to account for the presence of such a structure, unless it were destined to pierce animal or vegetable tissues, and thus enable them to suck the organic juices—a supposition which seems borne out also by the thread-like dimensions of the œsophageal canal in the genus *Tylelenchus*. The so-called gastric teeth met with in some of the free as well as the parasitic Nematodes, in the terminal dilated portion of

the œsophagus, constitute also, I believe, in reality, a valvular apparatus, probably connected with this same process of suction.

The power of repairing injuries possessed by these animals seems to be very low. In a specimen of *Oncholaimus vulgaris*, the head and œsophageal part of the body were severed from the remaining portion; and during the three days that the pieces were observed, although both portions continued to move about with tolerable activity, not the slightest attempt at repair was seen—no contraction even or closing up of the cut ends, such as almost instantly occurs when a *Naïs* is similarly injured. The chitinous nature of the integument in the Nematoids almost precludes contraction, and nothing like circular muscles seems to exist. On another occasion I found the anterior half of an individual of the same species moving about freely a fortnight after section of its body, but presenting no attempt at repair. Similar results have been arrived at with one or two other species, and with sections made in various parts of the body.

I have not yet obtained much positive information with regard to their duration of existence, but, from what I have seen, suspect it rarely exceeds from six to ten months [1]. In *Mononchus truncatus* I have ascertained that in about two months the embryos had attained two-thirds of their adult size, and were only then beginning to emerge from their asexual condition, the very first rudiments of a genital apparatus being just perceptible. The rate of growth after this seems to be still slow and gradual; and the females appear to die after the production of a single brood or batch of ova. Such is certainly the case with the *Vibrio tritici*; and, as pointed out by Davaine[2], the total duration of the *active* life of this animal is about nine or ten months.

The different members of this group vary much as to their tenacity of life. As a rule they are frail and delicate, and do not recover even after a slight desiccation of five or six minutes, thus differing remarkably from what I have at present observed with members of the four land and freshwater genera, *Tylelenchus*, *Plectus*, *Aphelenchus*, and *Cephalobus*: with all these there is a remarkable tenacity of life and power of recovery after what seems to be complete desiccation. This power of revivification, now so well known to be possessed by the young of the *Vibrio tritici*, was first ascertained by its discoverer, Turberville Needham, in 1743; and afterwards the same property was recognized by Spallanzani in certain species of minute Nematoids found in tufts of moss; and a series of experiments were instituted by him with the view of estimating the extent of this power. These experiments have been repeated and extended in the most careful and conclusive manner by MM. Davaine[3], Doyère[4], and Gavarret[5]; and the remarkable advantages proved to be possessed by these minute animals have been erroneously supposed by most writers to be characteristic of the whole group[6]. I hope to make more extended observations on this head, and to be able to point out more fully hereafter the particular genera in which this capability of resisting desiccation exists, with the ana-

[1] The period of those species capable of revivification is, of course, altogether a variable quantity; and I speak more particularly concerning the *active* life of the other members of the family.

[2] Recherches sur l'Anguillule du Blé niellé. Paris, 1857.

[3] *Loc. cit.* pp. 39–61.

[4] Ann. des Sc. Nat. 2e sér. t. xiv., xvii. & xviii.

[5] Ibid. 4e sér. t. xi. p. 315.

[6] Davaine's observations come very near to the truth in this respect (Ann. des Sc. Nat. sér. 4, 1858, tom. x. p. 335.)

tomical peculiarities which distinguish them from their less fortunate allies. It is an established fact that the young of the so-called *Vibrio tritici* are capable of resuming their activity, by immersion in water, after having remained dormant within their seed-like gall for a period of twenty-seven years, since Baker was enabled to establish this fact in 1771 with specimens given to him by Needham in 1744[1]; and I have lately been informed by one of the Fellows of this Society[2] that he has succeeded in restoring them after a period of "about twenty years," though it was stated by Bauer in his well-known paper in the 'Philosophical Transactions' for 1822[3], and by other observers, that from five to eight years was the limit; whilst lately, in his valuable work on 'Entozoa,' Dr. Cobbold has reported the period to be no more than "four or even five years." These discrepancies depend doubtless to a certain extent upon the manner in which the gall has been preserved during the interval, and upon certain differences in the hygrometrical conditions to which it has been subjected, just in the same way as seeds retain their power of germination for a variable period under the influence of different methods of preservation. I have been able to verify the observations of Spallanzani, Dujardin, and others, regarding the degree of vitality of the Nematodes found in tufts of moss, though they do not in reality belong to the genus *Rhabditis*, as reported by Dujardin, but are distinct forms, which I have included in the genera *Plectus* and *Aphelenchus*. And, more marvellous still, I took, this summer, during the long-continued drought of months, from the top of a slate roof with a southern aspect, and fully exposed to the direct rays of the sun, a patch of the yellow lichen, *Parmelia parietina*, for the purpose of examination—though more with a view of making quite sure that there were no Nematoids in it than with the expectation of finding any—when, after placing a small portion with some water in a watch-glass, I was extremely surprised on looking at it with a lens about two hours afterwards, to see forty or fifty of these little Nematodes in the full swing of life and activity. But with these other Nematoids of moss and lichen it is not as with the *Vibrio tritici*, that this remarkable power is possessed only by young and immature individuals, since it is enjoyed also by adults having fully developed ova within them. I have found no representatives of these particular types in salt water; and, as far as my experience goes, those found in this situation are all incapable of being revived after having remained without water, on a slip of glass, for a few minutes. A statement apparently in direct opposition to this was made by Otto Müller in his 'Animalia Infusoria.' Two marine species, named by him *Vibrio gordius* and *V. anguillula marina* respectively, were stated to revive after desiccation by the addition of spring water; but, since he does not make any definite statements concerning the length of time during which the movements continued, I suspect that what he observed may be nothing more than what I have myself seen very frequently, namely, two or three tolerably brisk contractions immediately on the addition of the water, gradually becoming less marked, and finally ceasing altogether in less than a minute. This effect I imagine to be physical

[1] Lettre de Needham en réponse au mémoire de Roffredi, dans le Journ. de Phys. de l'Abbé Rosier, t. v. p. 227, 1775.

[2] W. H. Ince, Esq.

[3] "Microscopical Observations on the Suspension of the Muscular Motion of the *Vibrio tritici*."

rather than vital, and due to the rapid imbibition of water by the previously dried animal.

With respect to the *Vibrio tritici*, I may state that this year I succeeded in infecting some wheat with young specimens taken from a gall several years old. As my stock was small, the method followed was that adopted by Bauer—that is to say, the placing some of the young Nematodes within the cleft of the seed, allowing them to dry in this situation, and then consigning the seeds to the earth in the ordinary way. This was done in the end of February last, when eighty seeds so infected were sown in a box containing ordinary soil; and on the 8th of July I discovered one plant evidently diseased. It was extremely stunted, being only about five inches in height; and the whole specimen was dry and withered, with the exception of the small and abortive ear. This contained no healthy florets, the diseased ones being about fourteen in number, each being composed of the slightly altered glumes and paleæ surrounding a *gall* of the usual size and ovoidal shape, instead of a germen. In confirmation of this view of the gall-like nature of the growth, as ascertained by Davaine[1], I may state that at the time when these bodies had attained their full size and maturity, the other healthy plants were only just flowering, the germens in them being minute and undeveloped. I am also able to testify to the probability of the correctness of Davaine's description of the precise method in which the disease is produced, and the young worms come in contact with the growing flower. Before his time the only observers who had attempted to explain the manner in which the young Vibrios reach the ear were Roffredi[2] and Bauer; and both these investigators imagined the little Nematodes obtained an entry to the vessels of the plant, and were so transmitted to the germen. Bauer, indeed, whose paper, apart from the special subject on which he wrote—namely, the degree of vitality of these animals—is full of inaccuracies, and whose figure and description of the adult animal is utterly unlike the original, imagined that the young, found in what he considered to be the diseased grain, were the products of a third generation in this spot, the two others having taken place within the vessels of the stem of the plant during the progress of the animals towards the flower. But the real process, according to Davaine, seems to be this:—When the infected galls are sown together with healthy seeds[3], the young in a week or so, according to the degree of moisture of the soil, make their way out of the softened gall, and, diffusing themselves in all directions, some come at last into contact with the budding plant just

[1] Davaine has occasionally found a small abortive germen within the same floral envelopes with the gall; and in this case the gall is most likely to have been produced in one of the rudimentary scales, which would have gone to form a stamen. He believes it may be formed out of any of the scales belonging to the central parts of the flower; and although, as a rule, all these parts participate in the formation of a single central gall, still occasionally as many as three growths of this kind develope within the same pair of *glumellæ*. On one occasion he found a growth of a similar nature, and with the same kind of contents, growing from one of the leaves of the wheat. After this, additional proof as to the nature of the growth is almost superfluous. All interested in this remarkable disease of wheat should consult M. Davaine's admirable memoir on the subject.

[2] Observations sur la Physique, t. v. p. 1, 1775.

[3] That the disease may be produced artificially, by placing the young within the cleft of a healthy seed, after the method of Bauer, I can have little doubt, after the result of my own experiment, though Davaine seems to be rather incredulous concerning this mode of its production (*loc. cit.* p. 16).

sprouting from the healthy seed, and then insert themselves between the sheaths of its leaves, gradually working their way round till they come to the innermost of these, where they remain for a variable time, without increasing much in size, till the rudiment of the future ear begins to form. The length of time during which they remain in this situation, and their degree of activity, depend upon the rapidity of growth of the plant and the moisture of the season. The remainder of the process may be best described in Davaine's own words; he says:—"L'épi du blé, avant de paraître au dehors, se forme et reste longtemps renfermé dans les gaînes des dernières feuilles. Les anguillules, libres dans ces gaînes, le rencontrent et peuvent s'introduire entre les parties qui le composent. Pour que l'invasion des anguillules soit suivie de la production de la *nielle*, il faut que la rencontre ait lieu à une époque très-rapprochée de la formation de l'épi. Lorsque celui-ci n'a encore que quelques millimètres de longueur, que les paléoles, les étamines et l'ovaire, ayant la forme d'écailles, ne sont point distincts les uns des autres, ces écailles sont constituées par des cellules naissantes très-molles, pulpeuses, qui se laissent pénétrer facilement, et c'est à cette époque que les anguillules en contact avec l'épi déterminent la production de la *nielle*, en s'introduisant dans leur parenchyme. Mais, lorsque ces écailles acquièrent la forme des diverses parties qui constituent la fleur du blé, lorsque le pistil bifide devient distinct, les anguillules ne pénètrent plus dans leur parenchyme, trop consistant sans doute, et la *nielle* ne peut plus être produite; c'est un fait que j'ai constaté par plusieurs expériences" (p. 18). This piercing and occupation of a part of the rudimentary flower arrests its development, though it stimulates growth. A gall-like body is more rapidly produced in the site which should have been occupied by the germen, whilst the young worms soon become perfectly developed males and females. These vary in number from two to ten or twelve in each gall, and, after producing an enormous number of ova containing fully formed young—which speedily liberate themselves, though they afterwards undergo little change—themselves die and wither, at the time when the gall begins to assume its characteristic purplish-brown or black appearance.

In harmony with this method of infection of the wheat by the *Vibrio tritici*, as revealed by Davaine, I may state that in several grasses I have found different species of these free Nematodes, lying between the inner sheaths of the leaves, near the bottom of the culm. In *Festuca elatior* I met with no less than five species in this situation, belonging to the genera *Dorylaimus*, *Mononchus*, and *Plectus*; and in the stalks of wheat and oats removed from stubble-fields I have frequently found specimens either of these genera or of *Rhabditis*, *Aphelenchus*, or *Cephalobus*. In addition to a malady of oats and maize similar to that of the wheat, and said to be produced by the same animal, Steinbuch[1], nearly a century ago, recognized a disease somewhat similar to the "purples" in two of the bent-grasses (*Agrostis*); and, from the frequent presence of these Nematoids in the situation named, I suspect such diseases of grass will be found more frequent, if specially looked after. As another instance of disease induced in plants by these animals may be mentioned the discovery of Kühn[2], who has ascertained that a long-known and recognized disease of the common teasel (*Dipsacus fullonum*) is owing to the presence of a number

[1] Naturforsch. xxviii. S. 233, tab. v.

[2] Zeitsch. für wissen. Zoolog. 1857, t. ix. p. 189.

of these minute Nematodes, which gives some parts of the flower a white filamentary appearance. They seem to be endowed with the same tenacity of life as *Tylelenchus tritici*, and, from their correspondence in anatomical details, evidently belong to the same genus. Whilst speaking of these parasites of vegetables, I may again mention the fact that two or three of the most highly organized species of the free Nematoids I have met with, all the specimens of which are provided with well-developed ocelli, have been found infesting some of the British marine Sponges. Although there can be no doubt of the animal nature of these latter, still the organization of Sponges is so peculiar that the conditions of existence of these minute Nematoids within their interstices may, on the whole, be considered much more nearly allied to those of the non-parasitic Nematoids in general than to those to which the parasitic forms are subjected within the various organs of more highly developed members of the animal kingdom. There would seem to be no more reason why these animals should be considered parasites on account of their habitat, than that those Annelids with which they are often associated in the *Spongiadæ* should, for a like cause, be brought under the same designation.

Classification.

The only two writers who have attempted to classify the free Nematoids are Diesing and Eberth; and since the opinions of both are so much entitled to respect, it will be only right for me to consider their respective schemes of classification, and point out, not only the nature of these schemes, but also in what way they appear to me to be defective.

Diesing's most recent communication is to be found in a paper entitled "Revision der Nematoden"[1], in which he treats of the classification of the Nematoids generally. I shall, of course, confine my attention to what he has to say on the free Nematoids. These, with one or two other genera of a doubtful nature, he includes under two families, the distinguishing characters of which he considers to be the presence or absence of cirrhi or setæ around the mouth. His arrangement is as follows:—

Family I. Cirrhostomea. Corpus capillare. Os terminale cirrhatum. Ocellata vel cæca. Penis haud vaginatus v. vagina tubulosa exceptus. Papilla suctoria caudalis nulla v. unica terminalis. Animalcula ut plurimum microscopica. Aquarum dulcium vel maris incolæ.

* *Ocellata.*

1. Phanoglene. 2. Enchelidium.

** *Cæca.*

3. Pontonema. 4. Amblyura.

Family II. Anguillulidea. Corpus capillare, inerme vel armatum. Os terminale sessile, v. in apice tubuli protractilis, inerme aut denticulatum, nudum vel papillis cinctum. Cæca, rarius ocellata. Penis haud vaginatus aut vagina dipetala inclusus. Papilla suctoria caudalis nulla vel unica terminalis vel duæ marginales. Animalcula minora. Aquarum dulcium vel maris incolæ, aut in animalibus variis endoparasita, nonnulla migratoria.

* Odontostomata. *Os dentatum. Cæca vel ocellata.*

† *Ocellata.*

5. Enoplus.

[1] Sitzungsb. der Kais. Akad. der Wissensch., xlii. Band, No. 28, p. 595.

†† *Cæca.*

6. Oncholaimus. 7. Dorylaimus. 8. Odontobius. 9. Diplogaster.

** Anoplostomata. *Os edentatum.*

10. Dicelis. 11. Anguillula. 12. Angiostomum. 13. Leptodera. 14. Isacis.

Genera inquirenda.

15. Phacelura. 16. Potamonema. 17. Nema.

More extended observation has convinced not only myself, but also Dr. Eberth, that this character, derived from the presence or absence of cirrhi, selected by Diesing as a family distinction, is altogether too inconsistent and variable. Several of the genera placed by Diesing in that family the members of which are supposed by him to have no cirrhi contain species which are abundantly furnished with these appendages, such as *Enoplus*, *Oncholaimus*, and *Odontobius*; and, moreover, their presence or absence is not always a character of sufficient importance to be employed even as a generic distinction. Five of these genera too, *Dicelis*, *Angiostomum*, *Leptodera*, *Isacis*, and *Phacelura*, are composed of species which are not free Nematodes at all, but parasitic forms infesting various kinds of insects, mollusks, myriapods, &c., concerning which I have already expressed my unwillingness to admit their identity with the free Nematoids till such a relation shall be fully established by a more accurate and precise knowledge of their anatomy than we at present possess.

Dr. Eberth also rejects this arrangement of the free Nematoids by Diesing as unsatisfactory, and offers in its place a readjustment of his own. He divides them into two principal families, but is doubtful and uncertain about some genera, such as *Dorylaimus*, *Diplogaster*, *Phanoglene*, and *Pontonema*. His main divisions are as follows:—

1. *Anguillulæ.*
   a. Nematodes with an unarmed mouth, with a cylindrical œsophagus, and well-marked stomach; without tail-glands or ocelli; partly free and partly parasitic.
   b. Nematodes with an unarmed mouth and simple œsophagus, without stomach and without tail-glands.

2. *Urolabes.* Nematodes without well-defined stomach, partly with and partly without cirrhi around the mouth; with or without ocelli, but provided with well-defined tail-glands. Habitat, fresh and salt water.
   a. Apharyngea.
   Amblyura. Phanoglene. Enchelidium.
   b. Pharyngea.
   * Cæca. *Oncholaimus. Odontobius.*
   ** Ocellata. *Enoplus.*

This classification is also extremely defective, though based upon characters having real importance, instead of such mere individual peculiarities as were adopted by Diesing. Eberth has also unfortunately attempted to range all the twenty-three new marine species discovered by himself under five of the old genera, with the result of greatly con-

fusing the nomenclature, since I feel quite convinced, from an examination of the beautiful figures he has given of these forms, that they cannot properly be included under less than from eight to twelve distinct genera.

So far as my own experience goes, I feel assured that even now, with the accession of new forms brought to light by myself, it is altogether premature to attempt anything like a philosophical classification; we are as yet but on the threshold of our knowledge of the multiplicity of types which will doubtless soon be revealed if the investigation is taken up by naturalists at home, and *à fortiori* if the subject enlists the attention of scientific observers in various quarters of the globe. In this memoir I have accordingly not ventured upon what may be called a classification, though I have carefully drawn up tables presenting a differential analysis of the characters of those of the genera whose anatomical details are sufficiently known. This has been done principally with the view of assisting in the identification of the species already described. On looking over these tables, one cannot but be struck with the fact of the almost universal distinctness of the land and freshwater from the marine types. In only one undoubted instance have I met with representatives of the same genus inhabiting both fresh and salt water (*Rhabditis*), since the marine species *Monhystera ambigua* and *M. disjuncta*, at present placed in this freshwater genus, will in all probability ultimately be found to belong to a distinct type, by virtue of certain anatomical peculiarities which distinguish them from other species of that genus in which they have been temporarily placed. One species of the freshwater genus *Dorylaimus* is also reported to have been found in salt water by Dujardin.

The ventral gland, or excretory organ, does not appear to be so common in the freshwater as in the marine genera; and, as far as I have recognized it in the former, it presents certain structural peculiarities. The peculiar "œsophageal ring," too, I have only met with as unmistakeably existing in some of the marine genera, and in these, curiously enough (though in this respect my experience appears to be contrary to that of Dr. Eberth), only amongst such as have either longitudinal or no perceptible striæ of the integument, as I have never once met with it in any species presenting well-marked transverse striæ. The ocelli are much more marked and more frequent in the marine species, though even the possession of such a well-marked appendage as this is not a character of constant generic importance. In the genera *Monhystera*, *Cyatholaimus*, and *Chromadora*, for instance, certain species are provided with ocelli, whilst others are without them; and their presence or absence seems frequently to be connected with the nature of the habitat. The degree of complexity of the male intromittent organs is also increased in the marine genera, since in these as many as two or even four accessory pieces may exist, whilst in the land and freshwater types the spicules are either solitary or provided with one single, posterior, median accessory piece. The shape and number of these organs afford excellent generic characters of a most constant kind, with the exception that occasionally, in genera whose species have spicules only, representatives will be met with presenting also a single posterior accessory piece. Such is the case in the genera *Oncholaimus*, *Comesoma*, and *Monhystera*. It may be, it is true, that this accessory piece exists in a membranous and undeveloped condition in the other species, and so is not

readily recognizable. The exact structure of the pharynx and œsophagus, the nature of the integumental markings or striæ, and the position and character of the duct of the ventral gland seem to me the other characters which, from their constancy, should be most relied upon in the construction of genera. The necessity of absolute accuracy concerning these details cannot be too strongly enforced, in view of the crude generalities which have been offered by some preceding observers as specific descriptions, many of which are absolutely useless as a means of identification, and serve only to swell the number of synonyms and uselessly perplex subsequent workers in the same field of research[1].

Family ANGUILLULIDÆ, Gervais & Van Beneden.

Free Nematoids.—Body cylindrical, tapering more or less at either extremity. *Integument* transparent, striated or plain; naked, or provided with papillæ or setæ; traversed by capillary pores; shed and renewed at intervals. *Caudal sucker* mostly present. *Glandular system* well developed; often single excretory organ in anterior part of ventral region. *Lateral lines* existing as cellular canals communicating with the exterior, with or without a central channel; in others replaced by distinct vessels. *Median lines* indistinct. *Nervous system*, none. *Ocelli*, when present, aggregations of reddish pigment on anterior part of œsophagus, with or without transparent lens-like bodies. *Generative organs—female*, composed of double symmetrical uteri and short reflexed ovarian tubes, with vagina near centre of body; vagina occasionally more posterior, with posterior uterine segment and ovary undeveloped; *ova* few, large: *male*, consisting of an almost simple seminal tube, and two equal horny spicules, either alone or with one or more accessory pieces.

[1] The best method of detecting and capturing these animals I have found to consist in separating with ordinary microscopical teasing-needles the specimens of algæ or coralline into small fragments, on the surface of a square piece of glass covered with a thin stratum of fluid, the glass being laid either upon a black surface or, better still, upon a small mirror, when the larger species may be recognized with the naked eye, and the smaller with an ordinary watchmaker's lens. They are best captured by taking them up upon the pointed extremity of a feather. I have employed an ordinary quill pen, with its upper extremity cut off obliquely. In the case of marine or freshwater mud, it should be spread out with a little water into a very thin stratum, when, in a minute or so, various spots of disturbance will indicate the position of these or other minute animals.

I am indebted to the kindness of my friend Howard Fox, Esq., of Falmouth, for being able to pursue in this inland locality (Broadmoor, Wokingham) researches concerning the marine Nematoids commenced at Falmouth, since he has abundantly supplied me at various times with mud, sand, and algæ from the estuaries and tide-pools of that place.

TABULAR LIST OF GENERA.

I. LAND AND FRESHWATER.

Spicules two, equal, with or without a single posterior median accessory piece.

* *Integument plain, or with longitudinal markings. Ventral excretory gland wanting.*

† *Caudal sucker small.*

1. Monhystera. *Integument* with lateral circular mark anteriorly. *Ocellus* single, often absent. *Pharyngeal cavity* none. *Œsophagus* cylindrical. *Uterus* unsymmetrical.
2. Trilobus. *Pharyngeal cavity* cup-shaped; no teeth. *Œsophagus* having three lobes at termination. *Males* with well-developed suckers in middle line above anal cleft.
3. Mononchus. *Pharyngeal cavity* large, oval, having one upper *tooth*-like projection. *Canal of œsophagus indicated by three bright lines.*

†† *Caudal sucker absent.*

4. Ironus. *Pharyngeal cavity* small, long, and narrow. *Œsophageal canal bounded by three bright lines.*
5. Dorylaimus. *Spear* exsertile, at commencement of *œsophagus, whose canal is indicated by three bright lines. Males* having oblique integumental markings on posterior extremity, with or without small median suckers above anal cleft.
6. Anguillula. *Pharyngeal cavity* very small. *Œsophagus* having oval swelling at termination, containing a simple valvular apparatus. *Uterus* unsymmetrical. *Spicules* long and narrow. *Accessory piece* single, distinct.

** *Integument with transverse striæ. Ventral excretory gland present or absent.*

† *Caudal sucker present.*

7. Tripula. *Striæ* well marked. *Pharyngeal cavity* none. *Œsophagus* with constricted portion at termination. Three large *pores* through integument in anterior part of ventral region.
8. Diplogaster. *Striæ* transverse and longitudinal. *Pharyngeal cavity* cup-shaped, with small horny plates at bottom. *Œsophagus* having large muscular swelling at middle of length. *Sucker* very minute. *Accessory* portion of penis well marked.

[a]9. Plectus. *Pharyngeal cavity* long and narrow. *Œsophagus* having oval swelling at termination, provided with a complex valvular apparatus. *Ventral gland having twisted duct opening near middle of œsophagus. Uterus* symmetrical.

[a]10. Aphelenchus. *Spear* simple, at commencement of *œsophagus*, which terminates in a large rounded muscular swelling. *Ventral gland-opening posterior to termination of œsophagus. Uterus* unsymmetrical. *Spicules* simple, without accessory piece.

[a] All the animals belonging to the genera having this mark affixed to them have a modification of the ventral gland, and are endowed with a remarkable tenacity of life.

†† *Caudal sucker absent.*

[a]11. Cephalobus. *Striæ* well marked. *Head* slightly bilobed. *Pharyngeal cavity* none, or small. *Œsophagus* having rounded swelling posteriorly, containing a simple valvular apparatus. *Ventral gland-opening opposite posterior part of œsophagus. Uterus* unsymmetrical.

Males having caudal alæ.

[a]12. Tylelenchus. *Spear* with trilobed base. *Œsophagus* having a rounded muscular swelling about its middle. *Ventral gland-opening opposite posterior part of œsophagus. Uterus* unsymmetrical. *Caudal alæ* narrow, unsupported.

13. Rhabditis. *Striæ* transverse and longitudinal. *Pharyngeal cavity* cylindrical. *Œsophagus* having elongated swelling at middle, with rounded one at termination, containing a simple valvular apparatus. *Uterus* symmetrical. *Caudal alæ* large, supported by rays.

II. MARINE.

Spicules two, equal, solitary, or with one, two, or four accessory pieces. Occasionally a single supplemental organ in ventral region, above anus. Ventral excretory gland present in all (?). *Caudal sucker universal.*

* *Integument plain, or with longitudinal markings. Œsophagus embraced by glandular* (?) *ring.*

† *Spicules solitary, or with a single posterior median piece.*

14. Symplocostoma. *Pharyngeal cavity* elongated, oval, complex, crossed by lines or bars, and having a funnel-shaped body on its inferior aspect. *Ocelli* present or absent. *Spicules* long, solitary.

15. Oncholaimus. *Pharyngeal cavity* large, oval, provided with three tooth-like projections. *Ocelli* none (?). *Uterus* symmetrical or unsymmetrical. *Spicules* solitary, or with a single accessory piece.

16. Enchelidium. *Pharyngeal cavity* none (?). *Ocellus* mostly large and single. *Spicules* long, narrow, with or without a single median accessory portion.

[b]17. Anticoma. *Integument* having a row of opposite setæ on dorsal and ventral surfaces. *Ocelli* none. *Vaginal glands* two, equal. *Spicules* solitary. *Supplementary organ* small.

[b]18. Phanoderma. *Pharyngeal cavity* small. *Ocelli* distinct, lateral. *Spicules* long, solitary. *Supplementary organ* small.

†† *Spicules having two equal accessory pieces.*

[b]19. Leptosomatum. *Pharyngeal cavity* none. *Ocelli* distinct, dorsal, occasionally coalescing. *Excretory glandular organs two, lateral, opening on either side of head. Supplementary organ* a small sucker-like prominence.

[b]20. Enoplus. *Pharyngeal cavity* indistinct, surrounded by three separate *teeth* or jaws. *Ocelli* not distinct from surrounding pigment. *No œsophageal ring, and integument with delicate transverse as well as longitudinal striæ.*

[c]21. Linhomomius. *Pharyngeal cavity* cup-shaped. *Œsophagus* enlarged behind pharynx and also at posterior extremity. *Œsophageal ring* (?). *Anal glands* large. *Accessory pieces* recurved.

[a] All the animals belonging to the genera having this mark affixed to them have a modification of the ventral gland, and are endowed with a remarkable tenacity of life.

[b] The species belonging to the genera having this mark affixed to them are all distinguished by the males being provided with a supplementary organ.

[c] The males of the species belonging to these three genera present the common character of reflexed accessory pieces.

** *Integument with transverse striæ or dots. Œsophageal ring absent.*

† *Ocelli absent.*

‡ *Uterus unsymmetrical.*

c22. Tachyhodites. *Pharyngeal cavity* absent. *Two* peculiar colourless bodies on dorsal surface near anterior extremity. *Vaginal glands* wanting. *Accessory pieces* recurved.

c23. Theristus. *Pharyngeal cavity* hemispherical. *Vaginal glands* two, unequal. *Accessory pieces* recurved.

24. Sphærolaimus. *Pharyngeal cavity* large, somewhat spherical. *Œsophageal canal* bounded by three longitudinal bands. *Vaginal gland* single, posterior. *Spicules* long, narrow, with a single posterior shield-shaped *accessory piece.*

‡‡ *Uterus symmetrical.*

25. Comesoma. *Integument* having lateral circular depressions near head. *Pharyngeal cavity* very small. *Spicules* long, narrow, with or without a very small posterior *accessory piece.*

26. Spira. *Integument* having lateral, convex, circular prominences near head. *Pharyngeal cavity* none. *Œsophagus* having a slight rounded swelling posteriorly. *Spicules* stout, curved, with two *accessory pieces.*

27. Odontobius. *Pharyngeal cavity* none. *Teeth* doubtful. *Spicules* stout, curved, with two *accessory pieces.*

†† *Ocelli present or absent.*

28. Cyatholaimus. *Integument* with transverse striæ or rows of dots. *Pharyngeal cavity* cup-shaped, with longitudinal markings. *Œsophagus* cylindrical. *Accessory pieces* strong, four, in two pairs. *Caudal sucker* elongated, cylindrical.

29. Spilophora. *Integument* with transverse rows of dots or striæ. *Pharyngeal cavity* cup-shaped, with longitudinal markings, and three processes extending backwards. *Accessory pieces* two, rather indistinct. *Caudal sucker* elongated, cylindrical. *Œsophagus* having well-marked swelling posteriorly.

30. Chromadora. *Integument* with transverse and longitudinal striæ. *Pharyngeal cavity* rather indistinct, three cuneiform processes extending backwards and in contact. *Accessory pieces* two, strong, hooked. *Caudal sucker* elongated, pointed.

GENERA WHOSE CHARACTERS ARE INSUFFICIENTLY KNOWN.

31. Amblyura, Hemprich and Ehrenberg.
32. Hemipsilus, Quatrefages.
33. Phanoglene, Nordmann.
34. Pontonema, Leidy.
35. Potamonema, Leidy.
36. Nema, Leidy.
37. Urolabes, Carter.

SYNONYMS OF PREVIOUSLY DISCOVERED SPECIES.

Ascaris flustræ *, Dalyell	Phanoglene flustræ, XXXIII. 5 †.
Anguillula agrostidis, Steinbuch vel ——— *graminearum*, Diesing	Tylelenchus agrostidis, XII. 6.
——— *dipsaci*, Kühn	Tylelenchus dipsaci, XII. 5.
——— *linea*, Grübe	Dorylaimus lineus, V. 12.
——— *longa*, Leidy	Trilobus longus, II. 3.
——— *mucronata*, Grübe	Rhabditis mucronata, XIII. 6.
——— *tritici*, Ehrenberg	Tylelenchus tritici, XII. 2.
Enoplus attenuatus, Diesing	Oncholaimus attenuatus, XV. 7.
——— *bioculatus*, M. Schultze	Chromadora bioculata, XXX. 8.
——— *coronatus*, Eberth	Leptosomatum coronatum, XIX. 6.
——— *crassiusculus*, Dujardin	Mononchus crassiusculus, III. 8.
——— *gracilis*, Eberth	Cyatholaimus gracilis, XXVIII. 6.
——— *ornatus*, Eberth	Symplocostoma ornatum, XIV. 4.
——— *rivalis*, Dujardin	Plectus rivalis, IX. 10.
——— *subrotundus*, Eberth	Enchelidium subrotundum, XVI. 4.
——— *tenuicollis*, Eberth	Symplocostoma tenuicolle, XIV. 2.
——— *tuberculatus*, Eberth	Phanoderma tuberculatum, XVIII. 3.
Lineola obtusicaudata, Kölliker	Phanoglene obtusicaudata, XXXIII. 4.
——— *rosea*, Kölliker	Phanoglene rosea, XXXIII. 3.
——— *Sieboldii*, Kölliker	Enoplus Sieboldii, XX. 14.
Oncholaimus fovearum, Dujardin	Mononchus fovearum, III. 6.
——— *muscorum*, Dujardin	Mononchus muscorum, III. 7.
Odontobius acuminatus, Eberth	Anticoma acuminata, XVII. 4.
Phanoglene bacillata, Eberth	Leptosomatum bacillatum, XIX. 4.
——— *longissima*, Eberth	Leptosomatum longissimum, XIX. 7.
——— *punctata*, Eberth	Leptosomatum punctatum, XIX. 2.
——— *subulata*, Eberth	Leptosomatum subulatum, XIX. 8.
Rhabditis aceti, Dujardin	Anguillula aceti, VI. 1.
——— *glutinis*, Dujardin	Anguillula glutinis, VI. 2.
——— *tritici*, Dujardin	Tylelenchus tritici, XII. 2.
Urolabes barbata, Carter	Symplocostoma barbatum, XIV. 5.
——— *ocellata*, Carter	Chromadora ocellata, XXX. 9.
——— *palustris*, Carter	Dorylaimus palustris, V. 11.
Vibrio anguillula marina, Müller	Pontonema marinum, XXXIII.
——— *tritici*, Bauer	Tylelenchus tritici, XII. 2.

* The first name, in italics, is that under which the species has been previously described, whilst the second, in ordinary roman type, is that under which it is described in the present memoir.

† The first figures refer to the number of the genus, the second to that of the species.

LAND AND FRESHWATER[1].

1. MONHYSTERA[2], Bastian.

Gen. Char. *Body* mostly tapering considerably posteriorly. *Caudal sucker* small, somewhat pointed. *Integument* unstriated; setæ very few; lateral circular mark on either side near anterior extremity. *Pharyngeal cavity* none. *Œsophagus* uniform, cylindrical. *Intestinal cells* not tessellated. *Vulva* about posterior third of body. *Uterus* unsymmetrical. *Viviparous or oviparous. Spicules* long and narrow. Accessory piece, when present, single, small. *Ocellus* single, often absent.

In all probability, the two species which I have named *M. disjuncta* and *M. ambigua* will hereafter be found to belong to a distinct genus; but, not having seen the females of either, I was unwilling to describe them apart, and have therefore placed them temporarily in that genus to which they seemed to be the most nearly allied.

1. M. stagnalis, n. sp. (Plate IX. figs. 9–11.)

Female, length $\frac{1}{15}''$, breadth $\frac{1}{250}''$.

External Characters.—Body opaque-white in part, tapering considerably at extremities, especially towards the posterior, which is long and filiform. Head truncated, having a circlet of 4–6 short setæ. Integument plain.

Œsophagus about $\frac{1}{8}$th of whole length. *Intestine* narrowed where encroached upon by genital tube, but widening considerably behind vulva. *Anus* $\frac{1}{111}''$ from posterior extremity. *Vulva* behind commencement of posterior third of body. *Viviparous*; young numerous. *Ocellus* bright red, on sheath of œsophagus.

Male, length $\frac{1}{22}''$, breadth $\frac{1}{454}''$. *Anus* $\frac{1}{142}''$ from posterior extremity. *Spicules* $\frac{1}{250}''$ long. *Accessory piece* small, somewhat triangular. *Spermatozoa* having slight vibratile movements, of an elongated oval form, $\frac{1}{5000}''$ long.

Hab. Mud from ponds, Falmouth and Easthampstead.

2. M. dispar, n. sp. (Plate IX. figs. 1, 2.)

Female, length $\frac{1}{23}''$, breadth $\frac{1}{555}''$.

External Characters.—Body scarcely tapering at all anteriorly, but abruptly behind vulva, and then gradually narrowing so as to terminate with a filiform extremity and minute pointed sucker. Head truncate, provided with 2–4 short setæ. Integument hyaline.

Œsophagus $\frac{1}{5}$th of total length. *Intestinal cells* containing rather large dark-coloured particles, having indistinctly tessellated arrangement. *Anus* $\frac{1}{143}''$ from posterior extremity. *Vulva* about commencement of posterior third of body.

Male, not seen.

Hab. In moss, Falmouth.

3. M. rivularis, n. sp. (Plate IX. figs. 3, 4.)

Male, length $\frac{1}{28}''$, breadth $\frac{1}{666}''$.

[1] Three exceptions to this,—*Rhabditis marina*, *Monhystera ambigua*, and *M. disjuncta* being marine, and found amongst the sand of tide-pools.

[2] *μόνος, single*, and *ὑστέρα, the uterus.*

External Characters.—Body tapering slightly anteriorly, but gradually to a point posteriorly. Head truncate; no setæ.

Œsophagus $\frac{1}{6}$th of total length. *Intestine* rather thinly covered with fat-particles. *Anus* $\frac{1}{300}''$ from posterior extremity. *Spicules* slightly enlarged at upper extremities, $\frac{1}{235}''$ long.

Female, not seen.

Hab. Sandy mud from stream, Falmouth.

4. M. LONGICAUDATA, n. sp. (Plate IX. figs. 5, 6.)

Female, length $\frac{1}{11}''$, breadth $\frac{1}{250}''$.

External Characters.—Body tapering slightly anteriorly, more considerably behind vulva, and terminating in a very long filiform extremity. Head truncate; no setæ.

Œsophagus about $\frac{1}{6}$th of total length. *Intestine* rather thinly covered with fat-particles, having indistinct tessellation. *Anus* $\frac{1}{7\frac{1}{1}}''$ from posterior extremity. *Vulva* near middle of body. *Uterus* unsymmetrical.

Male, not seen.

Hab. Fine sedimentary sand, pond, Tunbridge Wells.

5. M. FILIFORMIS, n. sp. (Plate IX. figs. 7, 8.)

Female, length $\frac{1}{44}''$, breadth $\frac{1}{1111}''$.

External Characters.—Body long and narrow, scarcely tapering at all anteriorly, but narrowing behind vulva, and thence onwards, so as to terminate in a long filiform extremity. Head truncate; no setæ.

Œsophagus $\frac{1}{5}$th of total length. *Intestine* sparingly covered with fat-particles. *Anus* $\frac{1}{160}''$ from posterior extremity. *Vulva* considerably behind middle of body.

Male, not seen.

Hab. About liverwort, from pier of bridge just above water-level, river Blackwater.

6. M. DISJUNCTA, n. sp. (Plate IX. figs. 12, 13.)

Male, length $\frac{1}{20}''$, breadth $\frac{1}{435}''$.

External Characters.—Body tapering slightly anteriorly, and also gradually to a point posteriorly. Terminal sucker small; another large and prominent in the mid-ventral region, $\frac{1}{1000}''$ from posterior extremity. Head rounded; no setæ. Integument plain, having a circular depression on each side of head $\frac{1}{10000}''$ in diameter.

Pharyngeal cavity very small, conical. *Œsophagus* about $\frac{1}{5}$th of total length. *Intestine* having a sphincter with traces of a valvular apparatus occupying its commencement, which is devoid of granules; remaining portion covered by very large cells, apparently arranged in two rows. *Anus* $\frac{1}{312}''$ from posterior extremity. *Genital* duct opening separately $\frac{1}{2000}''$ above anus. *Spicules* at anal cleft, slightly curved, $\frac{1}{666}''$ in length, with two (?) small triangular accessory pieces. *Spermatozoa* linear, $\frac{1}{1000}''$ long, having slowly undulating movement.

Female, not seen.

Hab. Marine, in sand from tide-pool, Falmouth.

7. M. AMBIGUA, n. sp. (Plate IX. figs. 14, 15.)

Male, length $\frac{1}{17}''$, breadth $\frac{1}{400}''$.

External Characters.—Body narrowing gradually anteriorly, but tapering to a point abruptly behind orifice of genital tube. Sucker small, pointed. Head obtusely rounded, naked. Integument plain, having circular depressions on each side of head $\frac{1}{7000}''$ in diameter.

Œsophagus about $\frac{1}{8}$th of total length. *Intestine* having a kind of sphincter, with traces of a valvular apparatus at commencement; otherwise covered with very large cells appearing in two rows, and containing rather light-coloured particles. *Anus* $\frac{1}{250}''$ from posterior extremity. *Genital tube* containing very large and distinct granular cells, opening $\frac{1}{1000}''$ above anus. No *spicules* visible either there or at anal cleft.

Female, not seen.

Hab. Marine, in sand from tide-pool, Falmouth.

2. TRILOBUS[1], Bastian.

Anguillula, Leidy.

GEN. CHAR. *Body* tapering considerably posteriorly. *Caudal sucker* small. *Integument* plain, or with longitudinal striæ; setæ scarce. *Pharyngeal cavity* rather large, cup-shaped. *Teeth* none. *Œsophagus* cylindrical, having three lobes at termination. *Intestinal cells* having pale-coloured fat-particles, more or less distinctly tessellated. *Vulva* about middle of body. *Uterus* bifid, segments symmetrical. *Spicules* solitary. Males having well-developed ventral suckers. Movements moderately active, frequently coiling when touched.

1. T. GRACILIS, n. sp. (Plate IX. figs. 20–22.)

Female, length $\frac{1}{12}''$, breadth $\frac{1}{263}''$.

External Characters.—Body pale white, tapering slightly anteriorly, and gradually narrowing to a point posteriorly. Head bluntly rounded, provided with 4–6 stout, short setæ. Integument rather thick, but very transparent, with longitudinal striæ $\frac{1}{10000}''$ apart.

Pharyngeal cavity distinct, cup-shaped. *Œsophagus* $\frac{1}{6}$th of total length, having three oval lobes at termination, each about $\frac{1}{770}''$ long. *Intestinal cells* containing almost colourless fat-particles, not having distinct tessellation. *Anus* $\frac{1}{108}''$ from posterior extremity. *Vulva* rather anterior to middle of body; whole of uterus and ovaries very readily seen.

Male much smaller than female, length $\frac{1}{17}''$, breadth $\frac{1}{476}''$. *Anus* $\frac{1}{182}''$ from posterior extremity. *Spicules* solitary, segments narrow, nearly straight, about $\frac{1}{666}''$ in length. Transverse striæ, as well as longitudinal, for some distance above the genital cleft of male; also in mid-ventral region a row of six large sacculi (suckers), in two sets of three, each sacculus about $\frac{1}{2500}''$ deep.

Hab. About the roots of *Ruppia maritima* from brackish water, Falmouth.

[1] τρεῖς, *three*, and λοβός, *a lobe*.

2. T. PELLUCIDUS, n. sp. (Plate IX. figs. 23, 24.)

Female, length $\frac{1}{9}''$, breadth $\frac{1}{222}''$.

External Characters.—Body white, tapering slightly anteriorly, more considerably posteriorly, where it terminates in a rather long filiform extremity, with a minute pointed sucker. Head truncate, provided with four short, spreading setæ. Integument transparent; no striæ visible.

Pharyngeal cavity cup-shaped. *Œsophagus* about $\frac{1}{6}$th of total length, having three pear-shaped lobes at termination, each about $\frac{1}{500}''$ long. *Intestine* well covered with light-coloured fat-particles tessellated in arrangement. *Anus* $\frac{1}{66}''$ from posterior extremity. *Vulva* slightly anterior to middle of body; genital organs very visible.

Male, not seen.

Hab. Mud from bottom of ponds, Falmouth. Has a habit of coiling itself into a circle when touched.

3. T. LONGUS.

Anguillula longa, Leidy, Proceed. of Acad. of Philad. v. p. 225.

"Body cylindrical, translucent, colourless. Mouth round; buccal cavity inverted, campanulate; œsophagus and intestine cylindrical, equal in diameter, the former $\frac{1}{25}''$ long.

"*Female*, 2 to 3 lines long; anteriorly $\frac{1}{333}''$ broad, middle $\frac{1}{285}''$. Tail narrow, acute, $\frac{1}{111}''$ to $\frac{1}{75}''$ long from anus.

"*Male*, $1\frac{1}{2}$ to 2 lines long, posteriorly dilated, obtusely rounded, curved, with three slight tubercular thickenings of the integument ventrally; $\frac{1}{285}''$ broad, at middle $\frac{1}{370}''$ broad. Penis a curved spiculum, $\frac{1}{280}''$ long.

"*Hab.* Found in very great abundance, wriggling about the surface of soft mud, in stagnant ditches in the neighbourhood of Philadelphia."

3. MONONCHUS[1], Bastian.

Oncholaimus, Dujardin; *Enoplus*?, Dujardin.

GEN. CHAR. *Body* tapering to a point posteriorly. *Caudal sucker* small, not pointed. *Integument* plain, or with longitudinal striæ; no setæ; papillæ present or absent around the mouth. *Pharyngeal cavity* large, oval, having one hook or tooth-like projection from the upper surface. *Œsophagus* cylindrical, canal indicated by three bright lines; transverse muscular fibres not distinct. *Intestine* well covered with hepatic cells; fat-particles light-coloured, having tessellated arrangement. *Vulva* about middle of body. *Uterus* bifid, segments symmetrical. *Spicules* —— ? *Lateral canals* very indistinct, having a slightly cellular appearance. Movements active.

Dujardin appears to me to have included in his genus *Oncholaimus* two distinct types, which, as far as I have yet ascertained, are exclusively denizens of fresh and salt water respectively. Since he has described a marine representative as his typical species, I have retained the old generic name with a more limited definition for the animals of

[1] μόνος, *single*, and ὄγκος, *a hook*.

this type, whilst I have transferred the freshwater members to my new genus *Mononchus*. The species of this latter genus differ from those of the former in having one pharyngeal hook only instead of three; in having the head sometimes furnished with papillæ, but never, as far as I have seen, with setæ; by the different structure of the œsophagus, and absence of the peculiar œsophageal ring; and, lastly, by the comparatively undeveloped condition of the caudal sucker and its appendages.

The males of this genus must be either very minute or very scarce; for though I have seen nearly one hundred female representatives of the different species, I have never met with a single specimen of the opposite sex.

1. M. TRUNCATUS, n. sp. (Plate IX. figs. 25, 26.)

Female, length $\frac{1}{15}''$, breadth $\frac{1}{285}''$.

External Characters.—Body tapering slightly anteriorly, but more considerably posteriorly. Head truncate; no papillæ. Integument with longitudinal striæ, $\frac{1}{7500}''$ apart.

Pharyngeal cavity oval, $\frac{1}{588}''$ in length, with a single hook projecting from upper surface. *Œsophagus* about $\frac{1}{4}$th of total length. *Intestinal cells* with light-coloured particles, having distinctly tessellated arrangement. *Anus* $\frac{1}{110}''$ from posterior extremity. *Vulva* slightly posterior to middle of body. *Lateral canals* broad, very indistinct, only recognizable behind intestine; no cells apparent—merely a few light-coloured scattered granules.

Male, not seen.

Hab. Small pool amidst decaying moss and liverwort, Falmouth.

2. M. PAPILLATUS, n. sp. (Plate IX. figs. 27, 28.)

Female, length $\frac{1}{11}''$, breadth $\frac{1}{250}''$.

External Characters.—Body opaque-white in colour, tapering slightly anteriorly, but gradually to a point posteriorly. Head truncate; mouth surrounded by four well-marked papillæ. Integument with longitudinal striæ, about $\frac{1}{10000}''$ apart.

Pharyngeal cavity a little removed from anterior extremity, proportionally rather small, $\frac{1}{714}''$ long; tooth single. *Œsophagus* $\frac{1}{4}$th of total length. *Intestinal cells* containing yellowish-coloured granules. *Anus* $\frac{1}{160}''$ from posterior extremity. *Vulva* at commencement of posterior third of body. *Uterus* bifid.

Male, not seen.

Hab. Between the sheaths of the leaves, at the lower part of culm of *Festuca elatior*, Broadmoor, Berks.

3. M. MACROSTOMA, n. sp. (Plate IX. figs. 29, 30.)

Female, length $\frac{1}{10}''$, breadth $\frac{1}{294}''$.

External Characters.—Body tapering very slightly towards head, more considerably posteriorly, where it is filiform for a short distance. Head obtusely rounded, with two papillæ, upper and lower. Integument with longitudinal striæ.

Pharyngeal cavity large, $\frac{1}{588}''$ long; hook single, $\frac{1}{1000}''$ long. *Œsophagus* about $\frac{1}{4}$th of total length; very slightly increased in size posteriorly, where also there is a di-

vergence of the bright lines representing the lumen. *Intestinal cells* well marked. *Anus* $\frac{1}{111}''$ from posterior extremity. *Vulva* at middle of body.

Male, not seen.

Hab. Small freshwater pool, in boggy ground, amidst decaying moss and liverwort, Falmouth.

4. M. TUNBRIDGENSIS, n. sp. (Plate IX. figs. 31, 32.)

Female, length $\frac{1}{23}''$, breadth $\frac{1}{416}''$.

External Characters.—Body scarcely tapering at all anteriorly, except quite at the extremity, opposite the pharyngeal cavity, where it becomes suddenly diminished in size; posteriorly it narrows rather abruptly behind anus, and then terminates in a curved filiform extremity. Head small, rounded; no papillæ. Integument having longitudinal striæ $\frac{1}{7500}''$ apart.

Pharyngeal cavity elongated, somewhat narrowed in the middle, $\frac{1}{14\frac{1}{28}}''$ long. *Œsophagus* $\frac{1}{5}$th of total length, uniform in size. *Intestinal cells* containing yellowish-coloured granules, and having a tessellated arrangement. *Anus* $\frac{1}{250}''$ from posterior extremity. *Vulva* slightly posterior to middle of body.

Male, not seen.

Hab. In fine sedimentary sand of small pond, Tunbridge Wells[1].

5. M. CRISTATUS, n. sp. (Plate IX. figs. 33, 34.)

Female (immature), length $\frac{1}{23}''$, breadth $\frac{1}{416}''$.

External Characters.—Body tapering very slightly anteriorly, but more considerably posterior to the anus, where it gradually narrows to a point, and is provided on the dorsal surface with an integumental prolongation or crista, whose greatest breadth is $\frac{1}{1666}''$. Head truncate, provided with a minute papilla above and below. Integumental striæ invisible.

Pharyngeal cavity large, oval, with one hook-like projection. *Œsophagus* between $\frac{1}{3}$rd and $\frac{1}{4}$th of total length, uniform in size. *Intestinal cells* not distinctly tessellated, containing small pale granules. *Anus* $\frac{1}{133}''$ from posterior extremity. *Vulva* considerably posterior to the middle of body.

Male, not seen.

Hab. In moss, Falmouth.

6. M. FOVEARUM.

Oncholaimus fovearum, Dujard. Hist. Nat. des Helminthes, p. 236.

"Corps trente à trente-trois fois aussi long que large; tête un peu anguleuse; cavité buccale oblongue, armée de deux ou trois pièces étroites, portant chacune (?) une forte dent en avant du milieu; œsophage long de $0^{mm}{\cdot}37$.

"*Femelle* longue de $2^{mm}{\cdot}5$, large de $0^{mm}{\cdot}075$, à queue amincie, assez longue, conservant une même longueur de $0^{mm}{\cdot}011$ dans sa dernière moitié, et terminée par une

[1] This species was very abundant in the specimen of mud selected; and as it was the first example of one of the free Nematoids that was carefully submitted to examination by me, in May 1863, I have retained the name of the place where it was found as a specific appellation.

sorte de ventouse (?); anus à 0^{mm}·18 de l'extrémité; vulve située au milieu de la longueur; utérus divisé en deux branches opposées, contenant une seule série d'œufs.

"Je l'ai trouvé à Rennes, au mois de Septembre, dans un fossé rempli par les eaux pluviales, et contenant des *Branchipus*, divers Entomostracés, des hydatides et des *Euglena*."

7. M. MUSCORUM.

Oncholaimus muscorum, Dujard. Hist. Nat. des Helminthes, p. 237.

"Corps trente-deux fois aussi long que large; tête rendue anguleuse par six ou huit papilles opposées, large de 0^{mm}·046; cavité buccale ovale, armée de trois pièces longitudinales arquées, dont une seule porte une forte dent en avant du milieu, tandis que les deux autres sont finement denticulées ou en peigne; œsophage long de 0^{mm}·55, large de 0^{mm}·04.

"*Femelle* longue de 2^{mm}·56, large de 0^{mm}·08; queue amincie, recourbée en crochet; anus à 0^{mm}·11 de l'extrémité; vulve saillante, située au tiers postérieur de la longueur; œufs longs de 0^{mm}·035.

"Il a été trouvé assez abondamment à Paris par mon ami M. Doyère, en 1839, dans les touffes de mousses (*Bryum*) des allées du Jardin des Plantes.

"J'ai depuis lors, en janvier 1844, trouvé à Rennes des Oncholaimes presque semblables dans l'intestin des *Gasterosteus lævis*, qui probablement les avaient avalés avec d'autres vers. Ils sont longs de 1^{mm}·6, large de 0^{mm}·09, avec la tête large de 0^{mm}·046, et la cavité buccale également longue de 0^{mm}·046."

8. M. CRASSIUSCULUS.

Enoplus crassiusculus, Dujardin, Hist. Nat. des Helminthes, p. 235.

"Corps long de 0^{mm}·60 à (?), large de 0^{mm}·026 à (?), vingt-trois fois seulement aussi long que large; tête large de 0^{mm}·015, hérissée de quelques soies roides; bouche montrant une armure interne; œsophage musculeux, épais, long de 0^{mm}·112, large de 0^{mm}·02.

"*Femelle* à queue allongée, amincie peu à peu; anus à 0^{mm}·12 de l'extrémité; vulve située vers le tiers postérieur.

"J'ai trouvé dans l'eau de la Vilaine, à Rennes, cet Helminthe, qui pourrait bien appartenir à un autre genre—à l'Oncholaime ou au Sclérostome, car il paraît avoir une cavité buccale distincte."

As it seems very doubtful to what genus this species really belongs, I have merely acted upon the suggestion of Dujardin, as expressed above, by transferring it to this group, in which are included the freshwater representatives of his genus *Oncholaimus*.

4. IRONUS[1], Bastian.

GEN. CHAR. *Body* long and narrow, tapering at extremities. *Caudal sucker* absent. *Integument* with delicate longitudinal markings; cephalic setæ present. *Pharyngeal cavity* long and narrow, having three small, moveable, rounded projections

[1] From εἴρων, *a dissembler*, on account of its habits of straightening itself and remaining still for a short time, as if dead, when touched.

near commencement. *Œsophagus* cylindrical, canal indicated by three bright lines; transverse muscular fibres not distinct. *Intestine* moderately well covered with hepatic cells containing light-coloured fat-particles indistinctly aggregated. *Vulva* about the middle of the body. *Uterus* bifid, segments symmetrical. *Spicules* ——? *Lateral canals* ——? Movements very sluggish.

I. IGNAVUS, n. sp. (Pl. IX. figs. 34 *a*, 34 *b*.)

Female, length $\frac{1}{13}''$, breadth $\frac{1}{555}''$.

External Characters.—Body long and slender, tapering very gradually at both extremities, till, at the posterior, it terminates in a long filiform portion. Head bluntly rounded, provided with a circle of four very short setæ. Integument having almost imperceptible longitudinal striæ, about $\frac{1}{30000}''$ apart.

Pharyngeal cavity long and narrow, having three small, rounded, valve-like plates near commencement. *Œsophagus* $\frac{1}{4}$th of total length. *Intestinal cells* containing light-coloured, non-tessellated particles. *Anus* $\frac{1}{100}''$ from posterior extremity. *Vulva* slightly anterior to the middle of body.

Male, not seen.

Hab. Stagnant water of Easthampstead Plain, amongst Diatomaceæ and decaying Algæ; also about the decaying submerged leaves of a species of *Myriophyllum* from the lake, Sandhurst.

5. DORYLAIMUS, Dujardin.

Urolabes, Carter; *Anguillula*, Grube.

GEN. CHAR. *Body* sometimes blunt and rounded, sometimes filiform posteriorly. *Caudal sucker* absent. *Integument* having longitudinal markings, more or less visible, and a series of minute pores on each side of body; setæ none; cephalic papillæ present or absent. *Pharynx* indistinct, but somewhat cup-shaped, having a long, horny and hollow exsertile spear projecting into and through it, which is renewed twice or oftener during the period of growth. *Œsophagus* having the posterior half, or one-third, of increased size; canal indicated by three bright lines; transverse muscular fibres not distinct. *Intestine* mostly well covered with hepatic cells containing fat-particles having a tessellated arrangement. *Vulva* about the middle of body. *Uterus* bifid, segments symmetrical. *Spicules* solitary, glaive-shaped; males having sometimes a variable number of linear ventral suckers in mid line above anal cleft, and also oblique markings of the integument. *Lateral canals* well developed and distinctly cellular.

The Nematoid (*D. stagnalis*) found by Dujardin at Rennes, within the stomachs of certain fish, appears to me identical with that form which I have met with so abundantly in mud from the bottom of freshwater ponds. Dujardin also appears to have found a marine representative of this genus, though I have searched for such in vain. Curiously enough, the form which Carter has taken as typical of his provisional genus *Urolabes* is undoubtedly a member of the genus *Dorylaimus*; and, from the absence of the caudal sucker amongst these, its habits would probably not be of the nature indicated by

Carter's generic name. Carter is inclined to believe that this *Urolabes palustris* may be the antecedent condition of the *Dracunculus*, or Guinea-worm, which is so prevalent as a parasite in the island of Bombay. But my investigations have almost convinced me that this is impossible, and principally for a reason which also occurred to Mr. Carter, but of the precise importance of which he does not seem to have been aware. He knew that the integument of the *Dracunculus* presented transverse striæ (most easily recognizable in the young), but could not succeed in demonstrating such striæ in *U. palustris*: to him its integument appeared plain. I have since ascertained that the integument in *Dorylaimus stagnalis* and others of the same genus not only has no transverse striæ, but is undoubtedly furnished with longitudinal ones[1]; and all my experience goes to prove that the nature of the integumental markings affords a constant character, not only of specific, but even of generic importance. Independently of this, there is the difficulty that no horny spear, such as exists in *U. palustris*, can be detected in the *Dracunculus*, and also the fact that nothing answering to the peculiar lateral sacculi discovered by myself[2] in the young Guinea-worms can be recognized in this, or has yet been found in any other species of Nematode, so far as I am aware, with the exception of *Dicelis filaria*, Dujardin. I may state, however, that from what I have seen of the anatomy of the *Dracunculus* and other members of the Nematoid order, I feel quite disposed to believe that its affinities are with these free Nematodes, and fully expect that one day this will be an established fact. I cannot but consider the step which Dr. Cobbold has taken in his recent work, of placing the Guinea-worm amongst the *Gordiidæ*, and constituting these a mere family of the order *Nematoidea*, as altogether a retrograde movement, and one almost in direct opposition to the existing state of our knowledge[3].

We are much indebted to Carter for his descriptions of the male and female genital organs of *U. palustris*, as well as for his account of the development of the spermatozoa. There appears to be no other representative of this genus *Dorylaimus* amongst the ten species described by him—five of which were marine, and five from fresh water.

In all the *Dorylaimi* examined, which had not yet attained their full development, I observed a second and somewhat larger spear a short distance behind the one *in situ*, and contained within the walls of the œsophagus. In due time this moves upwards in some obscure way, and finally displaces the other, just as the deciduous is replaced by the

[1] It is from my observations on the anatomy of *D. stagnalis* that I have become perfectly convinced that the integument does present longitudinal, but no transverse markings. In this species I have frequently examined portions of integument freed from all other structures. But in the members of some other genera of free Nematoids not presenting transverse striæ, I am in many cases doubtful whether the integument is perfectly plain or has longitudinal markings—and this not only on account of the greater difficulty of recognizing such striæ, but also from the danger of confounding the appearance of the longitudinal muscles as seen through the integument with actual markings of this structure.

[2] Transactions of the Linnean Society, vol. xxiv. pl. 22. figs. 57–60.

[3] Nearly all the anatomical details of *Dracunculus*, so far as they are known, are in harmony with those of many typical Nematoids, whilst they differ considerably from those stated to obtain amongst the *Gordiidæ*. And if we may rely upon existing information, the difference as regards important anatomical characters is infinitely greater between these animals and the Nematoids generally than between any two of the families composing this latter order.

permanent tooth. It is not the whole of the rigid spear, however, that is renewed in this manner, but only what appears to be the anterior half of it.

1. D. STAGNALIS, Dujardin. (Plate IX. figs. 35–37.)

Dujardin, Hist. des Helminthes, p. 231, pl. iii. fig. C.

Female. Length $\frac{1}{4}''$, breadth $\frac{1}{111}''$.

External Characters.—Body dark-coloured, tapering gradually anteriorly, but more abruptly posteriorly, where it terminates in a pointed filiform extremity. Head truncate; no papillæ. Integument thick, with longitudinal markings $\frac{1}{2000}''$ apart; lateral pores easily recognizable, and about $\frac{1}{1428}''$ apart.

Spear $\frac{1}{357}''$ long. *Œsophagus* $\frac{1}{5}$th of total length, posterior half enlarged. *Intestinal cells* having a tessellated arrangement, and containing dark-olive-coloured fat-particles. Posterior portion of intestine for about $\frac{1}{50}''$ narrower, and very scantily covered with cells and granules. *Anus* $\frac{1}{74}''$ from posterior extremity. *Vulva* slightly anterior to middle of body. *Ova* lying two or three abreast, within uterus.

Male. Length $\frac{1}{5}''$, breadth $\frac{1}{125}''$.

Œsophagus proportionally longer than in the female. *Anus* $\frac{1}{666}''$ from posterior extremity. *Spicules* solitary, $\frac{1}{250}''$ long. Oblique integumental striæ well-marked.

Hab. Mud from freshwater ponds, Falmouth; and New Cross, Kent.

Individuals of this species were found by Dujardin in the stomachs of the Carp (*Cyprinus carpio*) and of *Gasterosteus lævis*; which specimens, he conjectures, had been swallowed accidentally by these voracious fish.

2. D. CARTERI[1], n. sp. (Plate IX. figs. 38–40.)

Female. Length $\frac{1}{14}''$, breadth $\frac{1}{290}''$.

External Characters.—Body tapering towards either extremity, especially posteriorly, where it is acuminated. Head truncate; no papillæ. Integument thick.

Spear $\frac{1}{450}''$ long. *Œsophagus* about $\frac{1}{5}$th of total length. *Hepatic* or intestinal cells well marked. *Anus* $\frac{1}{455}''$ from posterior extremity. *Vulva* in the middle of body. *Ova* large.

Male, same size as female.

Œsophagus longer. *Spicules* $\frac{1}{500}''$ long by $\frac{1}{2000}''$ broad. Oblique markings of integument for some distance above spicules; also 8–11 minute *suckers* communicating with corresponding slanting channels through the integument, about $\frac{1}{1428}''$ apart, in the mid-ventral region.

Hab. Stagnant water, with decaying liverwort and moss: Falmouth.

3. D. OBTUSICAUDATUS, n. sp. (Plate IX. figs. 41, 42.)

Female. Length $\frac{1}{9}''$, breadth $\frac{1}{175}''$.

External Characters.—Body tapering considerably for some distance from anterior extremity, but not at all posteriorly, where it is blunt and rounded. Head truncate,

[1] Named after Mr. Carter, so as to connect his name with a species of that genus many of the details of whose anatomy were first carefully recorded by himself.

marked off by a constriction from the rest of the body. Integument with longitudinal striæ $\frac{1}{10000}''$ apart.

Spear $\frac{1}{400}''$ long. *Œsophagus* about $\frac{1}{5}$th of total length; anterior half narrow, posterior much wider. *Intestinal cells* not having tessellated arrangement, but well filled with rather small fat-particles. *Anus* $\frac{1}{500}''$ from posterior extremity. *Vulva* slightly posterior to middle of body.

Male not seen.

Hab. Amidst rich mould and decaying leaves, from a damp and shady wood, Falmouth.

4. D. TENUICAUDATUS, n. sp. (Plate IX. figs. 43, 44.)

Female. Length $\frac{1}{14}''$, breadth $\frac{1}{360}''$.

External Characters.—Body tapering very gradually anteriorly, but rapidly behind anal cleft, where it terminates in a long filiform extremity. Head truncate, furnished with two small papillæ. Integument with longitudinal markings.

Spear $\frac{1}{666}''$ long. *Œsophagus* about $\frac{1}{7}$th of total length, posterior half enlarged. *Intestinal cells* well marked. *Anus* $\frac{1}{100}''$ from posterior extremity. *Vulva* slightly posterior to the middle of body.

Male not seen.

Hab. Fine sandy mud from pond, Tunbridge Wells.

5. D. TRITICI, n. sp. (Plate X. figs. 45–47.)

Female. Length $\frac{1}{13}''$, breadth $\frac{1}{357}''$.

External Characters.—Body white, tapering very slightly anteriorly, and not at all posteriorly, where it is blunt and rounded. Head bluntly rounded, marked off by a constriction; no papillæ. Integumental markings not apparent.

Spear $\frac{1}{333}''$ long. *Œsophagus* rather less than $\frac{1}{3}$rd of total length, posterior half enlarged. *Intestinal cells* having a tessellated arrangement, and containing light-coloured fat-particles. *Anus* $\frac{1}{833}''$ from posterior extremity. *Vulva* slightly posterior to middle of body; segments of uterus very short, extending only about $\frac{1}{154}''$ on either side of vagina.

Male. Length $\frac{1}{17}''$, breadth $\frac{1}{500}''$.

Œsophagus much shorter than in female. *Anus* $\frac{1}{1000}''$ from posterior extremity. *Spicules* $\frac{1}{666}''$ long. *Suckers* 9, mid-ventral, the first being $\frac{1}{400}''$ above anus, and the others being equidistant and $\frac{1}{2000}''$ apart.

Hab. About the roots of wheat growing in a sandy soil, and also between the lower sheaths of its leaves: Broadmoor, Berks.

6. D. FILIFORMIS, n. sp. (Plate X. figs. 48, 49.)

Female. Length $\frac{1}{10}''$, breadth $\frac{1}{590}''$.

External Characters.—Body very long and slender, tapering only slightly anteriorly, but considerably posteriorly, where it terminates in a fine point. Head truncate; no papillæ. Integumental markings not visible.

Spear $\frac{1}{590}''$ long. *Œsophagus* $\frac{1}{6}$th of total length, posterior third enlarged. *Intes-*

tinal cells not distinctly tessellated, and containing light-coloured fat-particles. *Anus* $\frac{1}{133}''$ from posterior extremity. *Vulva* in the middle of body.

Male not seen.

Hab. With Diatomaceæ, on the decaying lower leaves of *Myriophyllum verticillatum* from pond, Bagshot.

7. D. POLYBLASTUS, n. sp. (Plate X. figs. 50, 51.)

Male. Length $\frac{1}{13}''$, breadth $\frac{1}{500}''$.

External Characters.—Body long and thread-like, tapering but very slightly at either extremity. Head rounded; no papillæ.

Spear $\frac{1}{1000}''$ long. *Œsophagus* $\frac{1}{7}$th of total length; posterior half enlarged. *Intestinal cells* moderately developed, and containing light-coloured fat-particles. *Anus* $\frac{1}{770}''$ from posterior extremity.

Spicules $\frac{1}{588}''$ long. *Suckers* 16–20, in mid-ventral region, commencing at $\frac{1}{417}''$ above anus, and occupying a space of about $\frac{1}{250}''$.

Female not seen.

Hab. With *Tylenchus Davaineii*, from moss coating a large boulder in freshwater stream, Falmouth.

8. D. PAPILLATUS, n. sp. (Plate X. figs. 52, 53.)

Female. Length $\frac{1}{10}''$, breadth $\frac{1}{222}''$.

External Characters.—Body opaque-white, tapering gradually anteriorly, but not posteriorly, where it is blunt and rounded. Head truncate, provided with a coronet of six large papillæ. Integument with longitudinal striæ $\frac{1}{4000}''$ apart.

Spear $\frac{1}{500}''$ long. *Œsophagus* $\frac{1}{4}$th of total length, gradually widening posteriorly. *Intestinal cells* abundant, tessellated, containing light-olive-coloured particles. *Anus* $\frac{1}{666}''$ from posterior extremity. *Vulva* near the commencement of middle third of body. *Uterus* symmetrical. *Lateral cell-canals* very distinct, owing to their contained granules being of a light olive-colour.

Movements very sluggish.

Male not seen.

Hab. Between the lower sheaths of the leaves of the Giant Fescue (*Festuca elatior*), Broadmoor, Berks.

9. D. TORPIDUS, n. sp. (Plate X. figs. 54–56.)

Female. Length $\frac{1}{15}''$, breadth $\frac{1}{285}''$.

External Characters.—Body tapering gradually anteriorly, but more suddenly at posterior extremity, which is acuminated. Head truncate, provided with four small crucial papillæ. Integumental markings not apparent.

Spear $\frac{1}{400}''$ long. *Œsophagus* about $\frac{1}{4}$th of total length; posterior half enlarged. *Intestinal cells* having a tessellated arrangement. *Anus* $\frac{1}{250}''$ from posterior extremity. *Vulva* slightly posterior to middle of body.

Male. Length $\frac{1}{17}''$, breadth $\frac{1}{500}''$. *Œsophagus* shorter. *Anus* $\frac{1}{400}''$ from posterior extremity. *Spicules* $\frac{1}{666}''$ long. *Suckers* none.

Hab. Same as last species.

10. D. INERS, n. sp. (Plate X. figs. 57–59.)

Female. Length $\frac{1}{13}''$, breadth $\frac{1}{285}''$.

External Characters.—Body tapering slightly anteriorly, but suddenly towards posterior extremity, which is acuminated. Head bluntly rounded. Integumental markings not visible.

Spear $\frac{1}{1000}''$ long. *Œsophagus* $\frac{1}{4}$th of total length, posterior third enlarged. *Intestinal cells* not well marked, and containing light-coloured granules. *Anus* $\frac{1}{333}''$ from posterior extremity. *Vulva* at middle of body.

Male. Length $\frac{1}{18}''$, breadth $\frac{1}{500}''$.

Œsophagus only half as long as that of female. *Anus* $\frac{1}{434}''$ from posterior extremity. *Spicules* $\frac{1}{588}''$ long. *Suckers* 5, mid-ventral, commencing about $\frac{1}{330}''$ above anus; distance between first two $\frac{1}{1000}''$, between the others gradually increasing.

Hab. Same as that of *D. polyblastus.*

11. D. PALUSTRIS.

Urolabes palustris, Carter, Ann. of Nat. Hist. 1859, 3 ser. vol. iv. p. 33, pl. ii. figs. 7, 9.

"*Female.* Length (max.) $\frac{1}{6}''$, breadth $\frac{1}{370}''$. Linear, cylindrical, smooth, white or colourless, unstriated transversely, gradually diminishing towards the head, which is obtuse and terminated by a distinct labiate portion, furnished with at least two, if not four, indistinct papillæ; diminishing abruptly towards the tail, which is attenuated and whip-like. *Mouth* in the centre of the anterior extremity. *Vulva* a little in front of the middle of the body. *Anus* at the root of the tail." . . . "*Œsophagus* commencing with a cup-like or buccal cavity, into the posterior part of which projects a sharp-pointed, horny, narrow tube (fig. 11 *d*), which is continued backwards in a straight line to the intestine, and is exsertile at the oral orifice."

"*Male* the same as the female, but smaller, and with the tail truncated almost close to the anus."

"*Hab.* Fresh water, in tanks and dirty drains wherever there is vegetable matter, mud, and putrescency, and in the gelatinous algæ during the 'rains:' Island of Bombay."

12. D. LINEA, Diesing.

Gordius lacteus, Müller?, Hist. Verm. terr. et fluv. i. ii. 32.

G. linea, Oken?, Lehrb. d. Naturg. Zool. i. Abtheil. 192.

Anguillula linea, Grube, Wiegmann's Arch., 1849, i. 367–368, tab. vii. figs. 15–17; Diesing, Syst. Helminth. p. 557.

Dorylaimus linea, Diesing, Sitzungsber. der kais. Akad. der Wissen. xlii. Bd. p. 626.

"*Corpus* intestino nigro percursum utrinque parum attenuatum, antice truncatum, margine paulo incrassato. *Cauda* subulata, fere $\frac{1}{12}$ longitudinis corporis. *Apertura genitalis* feminea subcentralis supera. Longit. fem. 2–8‴, crassit. ad $\frac{1}{7}‴$.

"Œsophagus postice bulbosus, denticulo solummodo retracto viso.

"*Hab.* In fondo aquarum cum *Sænuride variegata,* haud raro Dorpati."—*Grube.*

13. D. MARINUS, Dujardin.

Hist. Nat. des Helminth. p. 231, pl. iii. fig. D.

" Corps blanc, long de 3^{mm}, large de $0^{mm}{\cdot}125$; rapport de la longueur à la largeur 24; stylet protractile, continué par un long tube flexible et par le canal triquètre de l'œsophage; tégument lisse.

" *Femelle* ayant la queue longue, effilée, la vulve au milieu de la longueur, et les œufs oblongs, longs de $0^{mm}{\cdot}07$; larges de $0^{mm}{\cdot}027$.

" Je l'ai trouvé dans l'eau de mer, parmi les algues, à l'Orient."

6. ANGUILLULA, Ehrenberg.

Vibrio, Müller; *Ascaris*, Goeze; *Rhabditis*, Dujardin.

GEN. CHAR. Body long, narrow, and tapering at extremities. *Caudal sucker* absent. *Integument* thin, presenting neither transverse nor longitudinal markings; setæ none (?); papillæ none (?). *Pharyngeal cavity* very minute. *Œsophagus* cylindrical, with rounded swelling posteriorly containing a simple horny valvular apparatus. *Intestine* sparingly covered with large colourless granules, presenting no appearance of tessellation; distinct cells not recognizable. *Vulva* posterior to the middle of body. *Uterus* unsymmetrical. *Oviparous* or *viviparous*. *Spicules* long, narrow, curved. *Accessory piece* single, posterior, somewhat fan-shaped. *Ventral gland* wanting. *Floating gland-cells* abundant. *Lateral canals* not recognizable.

Movements active.

Under the old imperfectly defined genus *Anguillula* have been ranged, from time to time by various observers, the most heterogeneous types; but the name has become so familiar, and to some extent distinctive of these free Nematoids, that I have thought it better to retain it with a limited signification, than to cast it aside altogether. This I have accordingly done, taking as a type *Anguillula aceti*, since this appears to have been so regarded by Ehrenberg, and modifying the general terms in which he formerly described the genus by the substitution of more exact statements, founded on the anatomical characters of that species[1]. This will undoubtedly exclude many of the other forms hitherto located in this genus, and amongst them the so-called *Anguillula tritici*, which I have now placed, with other allied species, in the new genus *Tylenchus*. Several of the species also that I have (from ignorance of their real characters) still retained under this generic name will, I have little doubt, have to be weeded out by subsequent observers, and transferred to other genera as more precise information is obtained concerning their anatomy.

I have already expressed my reluctance to assent to Diesing's arrangement when he places in this genus many parasitic forms found in beetles, myriapods, and other animals. Some of these species, which, in his 'Systema Helminthum,' Diesing had included in the

[1] I am indebted to the kindness of Dr. Davaine for the opportunity I have had of examining these animals myself. Before obtaining a supply from him, I had in vain endeavoured to procure them. They are much less frequent than is generally imagined, at all events in England; and this may be due in great measure to the adulteration of our vinegar with sulphuric acid.

genus *Anguillula*, he has now, in his more recent 'Revision der Nematoden,' transferred to the genus *Isacis* of Lespés; whilst he includes, as subsections of the former genus, certain other of these parasitic forms, mostly discovered by Dr. Leidy, of Philadelphia, and placed by him, rightly enough, in distinct genera—*Streptostoma*, *Thelastoma*, and *Hystrignathus*.

For many of the descriptions and references concerning old species placed in this and other genera I have freely availed myself of Diesing's admirable work.

1. A. ACETI, Ehrenberg. (Pl. X. figs. 59*a*–59*c*.)

Borellus, Obs. Microscop. Centur. 7, 1656.
Power, Microsc. Obs. 38.
Hook, Microsc. i. 2, tab. i.
Joblot, Obs. Micr. i. 2, tab. i.
Leeuwenhoek, Phil. Trans. 1676, p. 656.
Cellius, apud Bakerum, ii. 250 (vivipara).
Backer, Micr. tab. x. 8, 9; Micr. Expl. 81, tab. v. 10.
Fränkische Samml. iv. 277, figs. *g–o*.
Goeze, Naturf. i. St. 1–53, et xviii. St. 38, tab. iii. 12–19.—Idem in Bonnet's Organis. Körp. 59.
Spallanzani, Opus. Phys. i. 83.
Rozier, Anguille du Vinaigre, Obs. 1775, Mars, tab. i. fig. 5; 1776, Janv., 51, et Mars, 382.
Essig-Aelchen, Martini, Allgem. Gesch. d. Nat. i. 412; Beschäft. Berlin. Gesellsch. i. 342.
Chaos redivivum, Linné, Syst. Nat. 1326 (aceti).
Vibrio anguillula, a. Anguillula aceti, Müller, Anim. Infus. 63, tab. ix. 1–11.—Idem, in Naturf. xix. St. 162.
Vibrio aceti, Bory, in Encycl. Méth. 1824, p. 788, tab. iv. 16.—Dugès, in Ann. des Sc. Nat. ix. 225, tab. xlvii. 2, 19, 32 ♀, et xlviii. 44–50 ♂, 51 (in copulâ).—De Blainville, in Dict. des Sc. Nat. lvii. 573 et lviii. 70.
Rhabditis aceti, Dujardin, Hist. Nat. des Helminthes, 242.
Czernay, Monogr. d. Essigälch. mit kol. Kpft. Moskau, 1849.—Idem, Bullet. de Moscou, xxii. (1849) 232–256, tab. vi. (cum anatom. et de evolut.).
Anguillula aceti, Ehrenberg, Infusionsth. 82.
Leidy, in Proc. Acad. Philad. viii. (1856) 48.
Hogg, Pop. Sc. Review, Jan. 1863, p. 216, pl. x.
Diesing, Syst. Helminth. ii. p. 128; et Sitzungsb. ais. Akad., Bd. xlii., No. 28, p. 627.

Female (size very variable). Length $\frac{1}{13}''$, breadth $\frac{1}{555}''$.

External Characters.—Body white, much obscured by colourless granules within integument; long and narrow, tapering very much posteriorly, and terminating in a long pointed extremity. Head rounded, unarmed. Integument thin, showing no striæ.

Pharyngeal cavity very minute, cup-shaped. *Œsophagus* $\frac{1}{9}$th of total length, having a rounded swelling at termination, containing valvular apparatus. *Intestine* covered with coarse colourless granules; no sort of tessellation. *Anus* $\frac{1}{80}''$ from posterior extremity. *Vulva* somewhat posterior to middle of body. *Uterus* unsymmetrical. Small *floating gland-cells* numerous in cavity of body.

Male. Length $\frac{1}{21}''$, breadth $\frac{1}{850}''$.

Œsophagus $\frac{1}{7}$th of total length. *Anus* $\frac{1}{133}''$ from posterior extremity. *Spicules* narrow, having a double curve, $\frac{1}{714}''$ long. *Accessory piece* about $\frac{1}{3}$rd as long as spicules, rather thick externally, but expanding inwards into a thinner fan-shaped portion.

"*Hab.* In fæcibus aceti (*Borellus, Müller*, &c.); in aceto communi cerevisiæ et vini, in aqua cum farina, in aqua cocta, et in fæcibus cerevisiæ, Moscoviæ (*Czernay*); in aceto e pomis parato, frequenter Philadelphiæ (*Leidy*)."

"Nota 1. Larvas muscæ cujusdam (*Mosilli cellarii*?) in aceto obvias cum hac specie confundit Spallanzani (Microsc. Beobacht. 176).

"Nota 2. Probabiliter e *Mosilli cellarii* intestinis in acetum translata."—Diesing.

If the drawings are accurate (Pop. Sc. Rev. Jan. 1863) of the animal discovered, by Mr. Jabez Hogg, about portions of the common truffle left for some days moistened with vinegar, I am rather inclined to believe that this will prove to be a distinct species, and not the real *A. aceti*, since it differs in several respects, more especially as regards the male spicules, from the animals examined by myself, concerning which there can be little doubt, seeing that they swarm in a specimen of pure vinegar, kindly sent to me by M. Davaine.

2. A. GLUTINIS, Ehrenberg.

Aale im Kleister, Ledermüller, Microsc. 33, tab. xvii. 1.—Buffon, Allgem. Hist. d. Natur, i. 2. 154.—Martini, Allgem. Gesch. d. Natur, i. 412.—Backer, Microsc. Expl. 82.—Schrank, Beitr. 109.—Leske, Naturg. i. 559.—Goeze, in Naturf. ix. St. 177, tab. iv. 17–19.

Chaos redivivum, Linné, Syst. Nat. 1326 (in glutine bibliopegorum).

Anguille de la Colle, Rozier, Obs. 1775, Mars, tab. i. 4, et 1776, Mars, 383.

Vibrio anguillula, β. *Anguillula glutinis*, Müller, Anim. Infus. 64, tab. ix. 1–4.

Vibrio glutinis, Bory, in Encycl. Méth. 1824, p. 780.—Dugès, in Annal. des Sc. Nat. ix. 225, tab. xlvii. 4, 10, 11, 20, 21 ♀, tab. xlvii. 22–25 bis, 26, 27, 30, 31, 33, 37, 38, 40, 41 ♀, 42, 43 ♂.—Blainville, in Dict. des Sc. Nat. xlvii. 53, et xlviii. 71.

Anguillula glutinis, Ehrenberg, Infusionsth. 82.

Rhabditis glutinis, Dujardin, Hist. Nat. des Helminthes, 243.—Leidy, in Proceed. Acad. Philad. viii. (1856) 49.

"Corps filiforme, assez épais, long de $1^{mm}{\cdot}68$; vingt fois environ aussi long que large, amincie en arrière et terminé par une pointe fine allongée; vulve située au tiers postérieur; œufs grands (de $0^{mm}{\cdot}09$) à coque membraneuse et contenant un embryon replié."—*Dujardin.*

"*Hab.* In glutine farinæ (*Baker, Müller*, &c.); in glutine tritici, secalis, tragacanthi, etc., frequenter Philadelphiæ (*Leidy*)."—*Diesing.*

In the paper before alluded to, Mr. Hogg seems to doubt the fact of any specific difference existing between this form and *Anguillula aceti*; but, from the descriptions of Dujardin, there appears to be a great discrepancy in the comparative dimensions of the two. Thus, speaking of *Anguillula aceti*, he reports it as, "trente à quarante-cinq fois aussi long que large," and so making the body much narrower than in *A. glutinis*. M. Davaine believes them to be distinct species, and says, in a letter lately received, "D'après quelques recherches que j'ai faites, il y a quelques années, je pense que les vers de la colle de pâte viennent de la terre, où elles vivent normalement dans les grains ou dans les racines qui contiennent de la fécule."

All my attempts to procure these animals in ordinary wheaten paste have been unsuccessful, though I have taken every precaution to ensure the purity of the flour.

3. A. FLUVIATILIS, Hemprich & Ehrenberg.

Ferskoands Aal, Strackker, in Nye Samml. of Dansk. Vid. Selsk. Skr. iii. D. 33.

? *Corculum vermiculo simile*, Linné, Amœn. Acad. (mundus invis.).

Vibrio anguillula, γ. *Anguillula fluviatilis*, Müller, Anim. Infusor. 65. tab. ix. 5–8. (Reliqua synon. Mülleri vel incerta, vel ad Anguillulam tritici aut Lumbrici pertinent.)

Vibrio fluviatilis, Bory, in Encycl. Méth. 1824, p. 777, tab. iv. 20–23.—Idem in Dict. Class. d'Hist. Nat. xvi. 586 (les Oxyurides), tab. v. A, 39.—Blainville in Dict. des Sc. Nat. lvii. 537, et lviii. 71.

Anguillula fluviatilis, Hemprich et Ehrenberg, Symb. Phys. Phytoz. Entoz. tab. ii. 8 et 13 (*libyca*).—Ehrenberg, Organ. Syst. u. geogr. Verb. d. Infusionsth. 1830, pp. 10, 15, 68, 105, tab. vii. 5 ; ejus Infusionsth. 82.—Dujardin, Hist. Nat. des Helminthes, 244.—Diesing, Syst. Helminth. ii. 130.

"*Cauda* recta brevi conica, subulata, baseos crassitie triplo quadruplove longior. Longit. $\frac{1}{8}$–$\frac{1}{3}'''$."—*Diesing*.

"Corpus subtilissime transverse striolatum, subannulatum. Tubus cibarius hinc ore illinc ano terminatus, simplex, cum strictura cardiaca. Os terminale, anus ad caudæ basim lateralis. Feminarum apertura genitalis in medio corpore. Uterus bicornis. Ova ovata. Fœtus maturus bis complicatus. Feminæ maribus majores. Maris penis simplex nec vaginatus. Ita in speciminibus Berolinensibus."—*Ehrenberg*, Symb. Phys. *l. c.*

"*Hab.* In aqua dulci in Dania (*O. F. Müller*).—Inter Confervas, in aqua Oascos Jovis Hammonis Siwæ, nec non pagi Tor in Arabia.—In Sibiria prope Tobolsk, in montibus altaicis prope Semimogorsk et prope Berolinum (*Ehrenberg*)."—*Diesing*.

The few definite characters given above, such as "corpus subtilissime transverse striolatum" and "uterus bicornis," seem pretty positively to indicate that this species does not in reality belong to the genus *Anguillula*. Any free Nematodes other than the "paste-" or "vinegar-eels," or the *Tylenchus tritici*, which have been accidentally met with or referred to by most English writers hitherto, have been provided with the convenient name of *Anguillula fluviatilis*; so that the altogether doubtful animal to which this cognomen rightly belongs has been invested with a pseudo-popularity for which, in all probability, it could make but little valid claim. It may perhaps belong to the genus *Plectus*, judging from the characters above mentioned, as well as the abundance and wide distribution of the animals of this type.

4. A. INFLEXA, Hemprich & Ehrenberg.

Anguillula inflexa, Hemprich et Ehrenberg, Symb. Phys. Phytoz. Entoz. tab. i. 12 (*Vibrio fluviatilis niloticus*).—Dujardin, Hist. Nat. des Helminthes, 244.—Diesing, Syst. Helminth. ii. 131.

"*Cauda* longiore subulata, maris inflexa, baseos crassitie plus decuplo longiore, corporis fere octavam partem æquante. Longit. mar. $\frac{1}{8}$–$\frac{1}{4}'''$, crassit. $\frac{1}{64}''$; fem. $\frac{1}{4}$–$1'''$, crassit. $\frac{1}{38}'''$.

"*Hab.* Inter Confervas aquæ Nili in provincia Dongola Nubiæ eandem formam cepisse monet cel. Ehrenberg, quam serius in aqua salsa prope Petropawlofsk in Sibiria et prope Berolinum reperiit."

5. A. COLUBER, Hemprich & Ehrenberg.

Vibrio coluber, Müller, Anim. Infus. 62, tab. viii. 16–18.

Anguillula coluber, Hemprich & Ehrenberg, Symb. Phys. Phytoz. Entoz.—Dujardin, Hist. Nat. des Helm. 244.—Diesing, Syst. Helminth. ii. 131.

"*Cauda* inflexa, longissima, corporis quarta parte longiore. Longit. . . . .

"*Hab.* In aqua fluviatili in Dania, rarissime (*O. F. Müller*); prope Berolinum (*Ehrenberg*)."

6. A. RECTICAUDA, Hemprich & Ehrenberg.

Anguillula recticauda, Hemprich & Ehrenberg, Symb. Phys. Phytoz. Entoz.—Dujardin, Hist. Nat. des Helm. 244.—Diesing, Syst. Helminth. ii. 131.

"Cauda recta, longissima, corporis quintam sextamve partem æquans. Longit. . . ."

"*Hab.* In aqua prope Berolinum (*Ehrenberg*)."

"Celeb. Ehrenberg individua cutem exuere vidit, quod in *Vibrione anguillula* pariter observavisse Müller et Roffredi asserunt."

7. A. DONGOLANA, Hemprich & Ehrenberg.

Anguillula dongolana, Hemprich & Ehrenberg, Symb. Phys. Phytoz. Entoz. tab. i. 13 (*Vibrio dongolanus*).—Dujardin, Hist. Nat. des Helminthes, 244.—Diesing, Syst. Helminth. ii. 131.

"*Corpus* recurvatum. *Cauda* brevissima, obtusissima, rotundata, parum longior quam crassa, fere nulla. Longit. $\frac{1}{4}'''$."

"*Hab.* Inter Confervas in aqua Nili Dongolæ (*Hemp. et Ehren.*)."

8. A. BRASSICÆ, Grübe.

Anguillula Brassicæ, nov. sp.?, Grübe, in Wiegmann's Arch. 1849, i. 365–367, tab. vii. 18–20.—Diesing, Syst. Helminth. ii. 557.

"*Extremitate* corporis antica vix attenuata obtusa rotundata, haud crenata, postica sensim subtiliter acuminata, cauda fœminæ fere $\frac{1}{6}$, maris $\frac{1}{4}$ corporis æquante pauloque incurva, œsophago postice haud incrassato, vulva pæne in medio corpore sita. Longit. $\frac{1}{25}'''$ (?), crassit. $\frac{1}{70}'''$."

"*Hab.* In brassica depravata, Novembri ad Martium usque, Berolini (*Münter* et *Oschatz*)."

"*Anguillulæ inflexæ* et *A. recticaudæ*, no. 4. et 6. affinis."

9. A. MINISTERIALIS, Diesing.

Vibrio glutinis, Humboldt, Ueber die gereizte Musk. u. Nervenf. i. 179.

Vibrio ministerialis, Bory, in Encycl. Méth. 1824, p. 778.—Diesing, Syst. Helminth. ii. 136.

"*Corpus* pellucidum. *Os* dilatatum, subhians; cauda acutissima. Longit. ad $\frac{3}{4}'''$."

"*Hab.* In fungis deliquescentibus (*Humboldt* et *Bory*)."

10. A. FÆCULORUM, Diesing.

Rhabditis fecalorum, Guérin-Méneville, in Acad. des Sc. Nat. Paris, 1845; Vers. in Oesterreich, K.-k. Wiener Zeitung, 1845, 7 Nov. 2362.—Idem in Comptes Rendus, xxi. (1845) 878.—Froriep, Neue Notiz. xxxvi. 186.—Diesing, Syst. Helminth. ii. 136 et 556.

"*Hab.* In Solani tuberibus depravatis (*Guérin-Méneville*)."

11. A. FOSSULARIS, Leidy.

Proc. of Acad. of Philad. v. 226.

"♀ Body cylindrical, anteriorly narrowed, truncated. Mouth round, surrounded by a

prominent circular lip; buccal apparatus none; pharynx short; œsophagus long, clavate or fusiform, slightly tortuous; intestine cylindrical, brown in colour; rectum distinct, cylindrical, colourless. Tail acute. Ovary double. Generative aperture anterior to the middle."

"Length 2 to $2\frac{1}{2}$ lines, breadth $\frac{1}{250}''$, tail $\frac{1}{80}''$ long from anus. Œsophagus $\frac{1}{28}''$ long; $\frac{1}{1333}''$ broad at commencement, $\frac{1}{400}''$ at termination. Intestine $\frac{1}{4750}''$ broad. Rectum $\frac{1}{75}''$ long."

"*Hab.* Stagnant ponds and rain-puddles in the suburbs of Philadelphia."

12. A. ECAUDIS, Ehrenberg.

Monatsber. d. Berlin. Akad. 1853 (solum nomen), et ibid. 1855, p. 226.—Diesing, Sitzungsb. der Kais. Akad. Bd. xlii. (1861) 629.

"*Hab.* In terra muscorum Montis Rosæ (*Schlagintweit* et *Ehrenberg*)."

13. A. LONGICAUDA, Ehrenberg.

Monatsber. d. Berlin. Akad. 1853 (solum nomen), et ibid. 1855, p. 226; ejus Mikrogeologie, 1854, tab. xxxv. B. A. iii. F. (sine descript.).—Diesing, Sitzungsb. der Kais. Akad. Bd. xlii. (1861) 629.

"*Hab.* In terra muscorum, Weissthorpass ad montem Rosæ, in altitudine 11,138′ (*Schlagintweit* et *Ehrenberg*)."

14. A. RANÆ TEMPORARIÆ, Perty.

Kleinste Lebensformen, 156.

"*Hab. Rana temporaria*, in tractu intestinali cum *Opalinis*, Bernæ (*Perty*)."

"Sine dubio Anguillulæ cum aqua haustæ vel cum cibo in intestinum translatæ."

7. TRIPYLA [1], Bastian.

GEN. CHAR. *Body* tapering at extremities. *Caudal sucker* large, well developed. *Integument* thick, having well-marked transverse striæ, with lateral and ventral pores; setæ none (?); cephalic papillæ present or absent. *Pharyngeal cavity* none. *Œsophagus* cylindrical, distinctly muscular; posterior part separated by a constriction, but not containing any valvular apparatus. *Intestine* rather sparsely covered with coarse granules, their arrangement in cells not being visible. *Vulva* at about the middle of body. *Uterus* bifid, segments symmetrical. *Spicules* of an elongated cuneiform shape. *Accessory piece* posterior, very small. *Lateral canals* indistinct, having a faintly granular appearance. No regular *ventral duct*, but three large integumental canals in same region, close to anterior extremity.

Movements active, often forming into a coil when touched.

1. T. GLOMERANS, n. sp. (Pl. IX. figs. 16, 17.)

Male, length $\frac{1}{11}''$, breadth $\frac{1}{256}''$.

External Characters.—Body white, cylindrical, tapering slightly forward, but more backwards, where it gradually narrows to the well-developed sucker. Head bluntly

[1] Τρεῖς, *three*, and πύλη, an orifice, in allusion to the three well-marked integumental openings.

rounded; no papillæ. Integument thick; transverse striæ very distinct, $\frac{1}{7500}''$ apart, having lateral pores and three larger equidistant channels opening through anterior part of ventral region.

Œsophagus about $\frac{1}{5}$th of total length; constricted portion $\frac{1}{1428}''$ long. *Intestine* sparsely covered with light-coloured fat-particles. *Anus* $\frac{1}{69}''$ from posterior extremity. *Spicules* cuneiform, slightly curved, $\frac{1}{333}''$ long. *Accessory piece* small and indistinct, somewhat triangular.

Female, not seen.

Hab. Mud from freshwater ponds, Falmouth; and Easthampstead, Berks.

2. T. SALSA, n. sp. (Plate IX. figs. 18, 19.)

Female, length $\frac{1}{8}''$, breadth $\frac{1}{208}'$.

External Characters.—Body cylindrical, tapering much the same as last. Head more rounded, provided with two papillæ, lateral (?). Integument thinner; transverse striæ not so well marked.

Œsophagus $\frac{1}{6}$th of total length; constricted portion large, $\frac{1}{833}''$ long. *Intestine* covered with rather large, light-coloured fat-particles. *Anus* $\frac{1}{65}''$ from posterior extremity. *Vulva* posterior to the middle of body. *Uterus* bifid. *Lateral canals* indistinct, $\frac{1}{1000}''$ broad.

Male, not seen.

Hab. About the roots of *Ruppia maritima*, brackish water, Swanpool, Falmouth.

8. DIPLOGASTER, Max Schultze.

GEN. CHAR.—*Body* tapering at extremities, especially at posterior. *Caudal sucker* very small, scarcely recognizable. *Integument* having longitudinal and also delicate transverse markings; setæ none (?); papillæ none (?); small lateral cervical markings. *Pharynx* cup-shaped, having two horny valvular plates at the bottom. *Œsophagus* having a well-marked muscular swelling about its middle; canal of anterior half indicated by three bright lines; not so, however, posterior to muscular swelling. *Intestine* moderately covered with fat-particles, having a more or less tessellated appearance. *Vulva* about the middle of body. *Uterus* bifid, segments symmetrical. *Spicules* two, curved, barbed. *Accessory piece* single, posterior, easily recognizable. *Ventral excretory gland* wanting. *Lateral canals* . . .

Movements very active.

1. D. FICTOR, n. sp. (Plate X. figs. 71–73.)

Female, length $\frac{1}{15}''$, breadth $\frac{1}{500}''$.

External Characters.—Body white, slender, tapering very slightly anteriorly, but considerably posteriorly, where it gradually tapers to a fine point; sucker not recognizable. Head truncate, unarmed. Integument with longitudinal striæ $\frac{1}{10000}''$ apart, and almost imperceptible transverse striæ $\frac{1}{20000}''$ apart.

Pharyngeal cavity $\frac{1}{3333}''$ deep. *Œsophagus* $\frac{1}{6}$–$\frac{1}{7}$th of total length, swelling in the middle, $\frac{1}{714}''$ long. *Intestinal cells* containing a moderate number of light-coloured par-

ticles, tessellated. *Anus* $\frac{1}{125}''$ from posterior extremity. *Vulva* slightly anterior to middle of body.

Male rather shorter, more slender, and transparent breadth being $\frac{1}{833}''$. *Anus* $\frac{1}{143}''$ from posterior extremity. *Spicules* curved, $\frac{1}{1111}''$ long. *Accessory portion* well marked, $\frac{1}{1666}''$ long.

Hab. With Diatomaceæ from the decaying lower leaves of *Myriophyllum verticillatum*, pond, Bagshot.

Has a habit, when touched, of straightening itself, and remaining perfectly still for a few seconds.

2. D. ALBUS, n. sp. (Plate X. figs. 74, 75.)

Female, length $\frac{1}{42}''$, breadth $\frac{1}{555}''$.

External Characters.—Body white, rather stout, tapering very slightly forwards, but considerably backwards, where it terminates in a short filiform extremity. Head bluntly rounded. Integument having longitudinal and transverse striæ.

Pharyngeal cavity large, cup-shaped, with valvular plates at bottom. *Œsophagus* $\frac{1}{6}$th of total length, having the usual median swelling $\frac{1}{1250}''$ long. *Intestine* slightly covered with light-coloured fat-particles. *Anus* $\frac{1}{285}''$ from posterior extremity. *Vulva* in middle of body.

Male, not seen.

Hab. About rootlets of wheat from sandy soil, Broadmoor, Berks.

3. D. FILIFORMIS, n. sp. (Plate X. figs. 76–78.)

Female, length $\frac{1}{41}''$, breadth $\frac{1}{1000}''$.

External Characters.—Body white and very slender, tapering very slightly anteriorly, but very considerably behind, where it terminates in a long filiform extremity. Integument with longitudinal striæ $\frac{1}{10000}''$, and transverse $\frac{1}{20000}''$ apart.

Pharyngeal cavity cup-shaped, with horny plates at bottom. *Œsophagus* about $\frac{1}{6}$th of total length, with usual swelling of mid portion. *Intestine* covered sparingly with light-coloured granules. *Anus* $\frac{1}{222}''$ from posterior extremity. *Vulva* at middle of body.

Male, length $\frac{1}{44}''$, breadth $\frac{1}{1250}''$.

Anus $\frac{1}{180}''$ from posterior extremity, which is longer than in female. *Spicules* could not be detected, though the *genital tube* could be readily seen in front of the anus.

Hab. Same as last.

I could detect no sucker with the microscope, though I feel confident that such a structure, however minute, must exist, since I have seen the male of this species swaying violently about in all directions, the extremely fine extremity of thread-like tail only remaining in a fixed position.

4. D. MICANS, Max Schultze.

V. Carus's Icones Zootomicæ, tab. viii. 1.

No description or reference.

Hab. Unknown.

9. PLECTUS [1], Bastian.

Enoplus?, Dujardin.

Gen. Char. *Body* tapering at either extremity. *Caudal sucker* pointed. *Integument* having transverse striæ; setæ or papillæ around head occasionally present. *Pharyngeal cavity* slightly dilated at first, then narrow and elongated; commencement of œsophagus marked by 4–6 bright slightly curved lines. *Œsophagus* cylindrical, but having an oval swelling posteriorly, in which is contained a horny valvular apparatus of the same shape. *Intestinal cells* mostly containing rather few pale-coloured fat-particles. *Vulva* about middle of body. *Uterus* bifid; segments short, symmetrical. *Ovarian tubes* short, broad, reflexed. *Spicules* . . . . . *Excretory gland* having linear duct twisted round œsophagus, and opening nearly opposite its middle in length. *Lateral vessels* with distinct double outline, commencing at lateral circular markings of integument, opposite pharyngeal region of body, and terminating posteriorly.

Movements active.

I have little doubt that the Nematoids found by Spallanzani in tufts of moss, and ascertained by him to possess the remarkable power of resuming all the functions of life after prolonged periods of torpidity and more or less complete desiccation, belonged to this genus; and it seems probable also that Dujardin, in his observations, has confounded together such forms as the members of this, and those corresponding to the type of his genus *Rhabditis*. I have found individuals of this genus in specimens of lichen brought by my friend Howard Fox, Esq., from Norway, and which had been lying in his cabinet for four years; none of the animals, however, exhibited signs of life after prolonged immersion in water. In these specimens of lichen, as well as in the fresh patches of *Parmelia parietina* which I have examined in this country, I have found the Nematoids associated with two or three species of Rotifera, as well as the peculiarly slow-moving little animals designated "Sloths" by the Abbé Spallanzani [2], and belonging, I believe, to the genera *Emydium* and *Macrobiotus*—all possessing about the same tenacity of life.

1. P. parietinus, n. sp. (Plate X. figs. 79, 80.)

Female, length $\frac{1}{23}''$, breadth $\frac{1}{400}''$.

External Characters.—Body white, tapering at either extremity, more especially posteriorly. Head truncate, provided with a circle of four large rounded papillæ. Integumental striæ transverse, $\frac{1}{18000}''$ apart.

Pharyngeal cavity $\frac{1}{643}''$ long. *Œsophagus* about $\frac{1}{4}$th of total length. *Intestinal cells* indistinctly tessellated, containing rather few light-coloured fat-particles. *Anus* $\frac{1}{250}''$ from posterior extremity. *Vulva* at middle of body. *Excretory ventral gland* having twisted duct opening at $\frac{1}{133}''$ from anterior extremity. *Lateral vessels* commencing at

[1] Πλεκτὸς, *twisted*, in allusion to the particular character of the duct of its ventral gland.

[2] Tracts on the Nat. Hist. of Anim. and Veget., translated by Graham Dalyell, ed. 2, vol. ii. pp. 129–166.

circular markings of integument $\frac{1}{1250}''$ from anterior extremity, by narrowed portions $\frac{1}{1333}''$ in length, with delicate vessels from $\frac{1}{10000}''$ to $\frac{1}{5000}''$ broad.

Male, not seen.

Hab. Hemispherical tufts of moss (*Tortula*) on the roofs of old houses or walls, and also from the yellow lichen (*Parmelia parietina*), Broadmoor, Berks.

2. P. CIRRATUS, n. sp. (Plate X. figs. 81, 82.)

Female, length $\frac{1}{16}''$, breadth $\frac{1}{435}''$.

External Characters.—Body slender, tapering at both extremities, especially posteriorly. Head rounded, provided with a circle of four very short cirri, about $\frac{1}{15000}''$ long. Integumental striæ $\frac{1}{20000}''$ apart, transverse.

Pharyngeal cavity slightly dilated at first, then long and narrow, length being about $\frac{1}{666}''$. *Œsophagus* less than $\frac{1}{4}$th of total length. *Intestinal cells* not well marked, and containing but few fat-particles. *Anus* $\frac{1}{154}''$ from posterior extremity. *Vulva* slightly posterior to the middle of body. *Duct of excretory gland* opening opposite middle of œsophagus. *Lateral vessels* commencing at $\frac{1}{1250}''$ from anterior extremity.

Male, not seen.

Hab. About lower decaying leaves of *Myriophyllum verticillatum*, pond, Bagshot.

3. P. TENUIS, n. sp. (Plate X. figs. 83, 84.)

Female, length $\frac{1}{33}''$, breadth $\frac{1}{1000}''$.

External Characters.—Body white, slender, tapering very slightly anteriorly and posteriorly. Head rounded, naked. Integumental striæ transverse, almost imperceptible, $\frac{1}{30000}''$ apart.

Pharyngeal cavity $\frac{1}{750}''$ long. *Œsophagus* more than $\frac{1}{4}$th of total length. *Intestinal cells* containing but few light-coloured fat-particles. *Anus* $\frac{1}{270}''$ from posterior extremity. *Vulva* at the middle of body. *Excretory duct* opening at $\frac{1}{188}''$ from anterior extremity. *Lateral vessels* commencing at circular markings $\frac{1}{2000}''$ from anterior extremity.

Male, not seen.

Hab. In transparent gelatinous matter, with *Vorticella chlorostigma*, from the shady margin of a lake, Sandhurst.

4. P. VELOX, n. sp. (Plate X. figs. 85, 86.)

Female, length $\frac{1}{26}''$, breadth $\frac{1}{500}''$.

External Characters.—Body white, tapering anteriorly and posteriorly, especially in the latter direction. Head rounded, unarmed. Integumental striæ transverse, $\frac{1}{20000}''$ apart.

Pharyngeal cavity $\frac{1}{1000}''$ long. *Œsophagus* $\frac{1}{4}$th of total length. *Intestinal cells* indistinctly marked, containing very few light-coloured particles. *Anus* $\frac{1}{250}''$ from posterior extremity. *Vulva* slightly posterior to the middle of body. *Excretory duct* opening at $\frac{1}{182}''$ from anterior extremity. *Lateral vessels* commencing at $\frac{1}{1666}''$ from anterior extremity.

Male, not seen.

Hab. From moss with *T. Davaineii*, Falmouth.

5. P. ACUMINATUS, n. sp. (Plate X. figs. 87, 88.)

Female, length $\frac{1}{30}''$, breadth $\frac{1}{666}''$.

External Characters.—Body white, tapering at both extremities, especially at posterior, which is narrow and acuminated. Head rounded, unarmed. Integumental striæ transverse, $\frac{1}{20000}''$ apart.

Pharyngeal cavity narrow, elongated, $\frac{1}{1111}''$ long. *Œsophagus* about $\frac{1}{4}$th of total length. *Intestinal cells* very indistinct, from their containing very few light-coloured fat-particles. *Anus* $\frac{1}{280}''$ from posterior extremity. *Vulva* in middle of body. *Excretory duct* opening opposite the middle portion of œsophagus. *Lateral vessels* commencing in the usual way, at $\frac{1}{2000}''$ from anterior extremity.

Male, not seen.

Hab. In moss.

6. P. PARVUS, n. sp. (Plate X. figs. 89, 90.)

Female, length $\frac{1}{47}''$, breadth $\frac{1}{1000}''$.

External Characters.—Body white, tapering anteriorly and posteriorly, especially in the latter direction. Head rounded, unarmed. Striæ transverse, $\frac{1}{30000}''$ apart.

Pharyngeal cavity $\frac{1}{1428}''$ long. *Œsophagus* about $\frac{1}{4}$th of total length. *Intestinal cells* very indistinct. *Anus* $\frac{1}{500}''$ from posterior extremity. *Vulva* at middle of body. *Excretory duct* opening opposite middle of œsophagus. *Lateral vessels* commencing at integumental circles $\frac{1}{2000}''$ from anterior extremity.

Male, not seen.

Hab. With *P. velox*, from moss covering stone lying in a freshwater stream, Falmouth.

7. P. TRITICI, n. sp. (Plate X. figs. 91, 92.)

Female, length $\frac{1}{10}''$, breadth $\frac{1}{454}''$.

External Characters.—Body white, tapering slightly anteriorly, but more posteriorly. Head rounded, unarmed. Transverse striæ readily seen, $\frac{1}{15000}''$ apart.

Pharyngeal cavity $\frac{1}{666}''$ long. *Œsophagus* only $\frac{1}{8}$th of total length. *Intestinal cells* containing few light-coloured fat-particles. *Anus* $\frac{1}{250}''$ from posterior extremity. *Vulva* about the centre of body. *Excretory duct* opening at $\frac{1}{133}''$ from anterior extremity. *Lateral vessels* commencing in usual way, at $\frac{1}{1666}''$ from head.

Male, not seen.

Hab. Between the lower part of the sheaths of leaves of wheat-stalks taken from a stubble-field with sandy soil, Broadmoor, Berks.

8. P. GRANULOSUS, n. sp. (Plate X. figs. 93, 94.)

Female, length $\frac{1}{20}''$, breadth $\frac{1}{550}''$.

External Characters.—Body opaque-white, narrow at anterior extremity, but not tapering in either direction so much as usual. Head rather truncate, unarmed. Striæ transverse. Whole body much obscured by a number of rather large colourless granules.

Pharyngeal cavity $\frac{1}{1428}''$ long. *Œsophagus* $\frac{1}{5}$th of total length. *Intestinal cells* indistinct. *Anus* $\frac{1}{400}''$ from posterior extremity. *Vulva* about middle of body. *Excretory duct* opening near middle of œsophagus. *Lateral vessels* commencing at $\frac{1}{1250}''$ from anterior extremity.

Male, not seen.

Hab. About the rootlets of oats from sandy soil, Broadmoor, Berks.

9. P. FUSIFORMIS, n. sp. (Plate X. figs. 95, 96.)

Female, length $\frac{1}{27}''$, breadth $\frac{1}{526}''$.

External Characters.—Body tapering considerably, both anteriorly and posteriorly. Head truncate, leaving no papillæ, but provided with four small setæ. Integument with transverse striæ, $\frac{1}{20000}''$ apart.

Pharyngeal cavity long and narrow. *Œsophagus* $\frac{1}{4}$th of total length. *Intestinal cells* containing few light-coloured granules. *Anus* $\frac{1}{250}''$ from posterior extremity. *Vulva* slightly posterior to the middle of body. *Excretory duct* opening opposite commencement of posterior $\frac{1}{3}$rd of œsophagus. *Lateral vessels* commencing at $\frac{1}{1250}''$ from anterior extremity.

Male, not seen.

Hab. Tuft of bright-green moss from thatched roof, Sandhurst.

10. P. RIVALIS, Dujardin.

Enoplus rivalis, Dujardin, Hist. Nat. des Helminthes, p. 235.

"Corps blanc, filiforme, aminci en arrière, long de $2^{mm}{\cdot}23$, large de 0^{mm}, quarante fois aussi long que large; tête large de $0^{mm}{\cdot}28$, tronquée en avant et hérissée de quelques soies roides; bouche armée intérieurement de trois pièces étroites, arquées, qui se réunissent à l'entrée de l'œsophage; œsophage musculeux, cylindrique, long de $0^{mm}{\cdot}34$, terminé par un petit ventricule, que précède un léger étranglement.

"*Femelle* longue de $2^{mm}{\cdot}23$ à 3^{mm}, large de $0^{mm}{\cdot}055$ à $0^{mm}{\cdot}08$, à queue insensiblement amincie, et terminée par un petit renflement d'où part une soie courte; vulve située un peu en avant du milieu; utérus divisé en deux branches opposées, qui, arrivées à $0{\cdot}^{mm}30$ ou $0^{mm}{\cdot}45$ en avant et en arrière de la vulve, se recourbent pour se continuer avec les ovaires correspondants qui reviennent de part et d'autre jusqu'au-dessus de la vulve commes deux larges tubes contenant une pile d'œufs comprimés; œufs elliptiques, longs de $0^{mm}{\cdot}06$."

"Je l'ai trouvé dans l'eau de la Seine, à Paris, et dans l'eau courante d'une fontaine à Blagnac, près de Toulouse, ainsi que dans la Vilaine, à Rennes."

I cannot feel certain about the genus to which this animal belongs, but have placed it in that to which the nature of its œsophagus allies it most: it is evidently not an *Enoplus*.

10. APHELENCHUS [1], Bastian.

GEN. CHAR. *Body* tapering more or less at extremities; posterior pointed, or blunt and rounded. *Caudal sucker*, if present, very small. *Integument* having transverse

[1] ἀφελής, *simple*, and ἔγχος, *a spear*.

striæ; setæ none; papillæ none (?). *Pharyngeal cavity* modified into a simple hollow exsertile (?) *spear*. *Œsophagus* having a distinct rounded muscular swelling at termination; lumen of œsophagus thread-like. *Intestine* not distinctly defined, from extremely small number and colourless nature of hepatic granules; internal or intestinal tube proper often very distinct. *Vulva* at about the commencement of posterior third of body. *Uterus* unsymmetrical. *Spicules* simple, slender, curved. *Accessory piece* none. *Excretory gland* having rather rigid, curved duct, opening posterior to junction of œsophagus with intestine. *Lateral vessels* . . . . . .

Movements sluggish.

In a member of this genus, *Aphelenchus parietinus*, I have very frequently met with certain bodies such as I have also recognized once in a species of the genus *Plectus*, and two or three times in *Tylenchus Davainii*. In these specimens a remarkable condition has been met with, in which, beneath the integument of the whole animal, in the general cavity of its body, and, in *A. parietinus*, also within the intestinal canal, there have been a large number of small spherical cellular bodies, simply granular-looking in this last species, but in the two others presenting the appearance of small hyaline cells, each of which contains a large, highly refracting, spherical central body or nucleus. What is their precise nature seems difficult to say at present. That their occurrence is exceptional, as well as other considerations, rather inclines me to the opinion that they are distinct organisms, perhaps belonging to the family *Gregarinidæ*, "a group of animals of very simple structure, met with in the intestine and other parts of many insects and Annelids" [1]. Whatever be their nature, they seem to correspond pretty closely to what Dujardin and other helminthologists have observed in certain parasitic Nematoids. Speaking of *Ascaris truncata*, this distinguished naturalist says[2]: —"Toutes les cavités interviscérales sont occupées, chez les mâles comme chez les femelles, par des vésicules indépendentes qui ont attiré l'attention de tous les helminthologistes, mais dont on n'a point indiqué la nature. Il semble qu'on ne peut dire autre chose, sinon que ce sont des productions parasites analogues aux acéphalocystes des mammifères." And a little further on (p. 220), after describing *A. maculosa* from the Common Pigeon, speaking of Rudolphi's observations, he adds:—"Il signale aussi dans le tégument des corpuscles orbiculaires diaphanes, beaucoup plus grands que les œufs, et qui rendent le corps presque tacheté, d'où le nom spécifique de *maculosa*. En disséquant ces ascarides, on voit en effet flotter avec les œufs, dans le liquide, des vésicules larges de $0^{mm}{\cdot}14$ à $0^{mm}{\cdot}30$, sur la nature desquelles il est difficile d'être fixé. Ce sont les mêmes que l'on trouve aussi dans l'ascaride du Perroquet, et que je crois analogues à des acéphalocystes."

1. A. AVENÆ, n. sp. (Plate X. figs. 97, 98.)

Female, length $\frac{1}{20}''$, breadth $\frac{1}{454}''$.

External Characters.—Body white, tapering very slightly at either extremity, both of

[1] "On our Present Knowledge of the *Gregarinidæ*," &c., by E. Ray Lankester, Journ. of Microsc. Soc., new series, vol. iii. p. 83.

[2] Hist. Nat. des Helminthes, p. 215.

of which are rounded. Head having no setæ or papillæ. Caudal sucker none. Integumental striæ transverse, $\frac{1}{10000}''$ apart, easily visible.

Dart $\frac{1}{1666}''$ long, simple, not knobbed at the base. *Œsophagus* $\frac{1}{14}$th only of total length, having a globular and distinctly muscular terminal swelling, $\frac{1}{1000}''$ broad. *Intestine*, portion next œsophagus very indistinct; granules scattered, rather coarse and colourless. *Anus* $\frac{1}{666}''$ from posterior extremity. *Vulva* posterior to commencement of hinder third of body, $\frac{1}{77}''$ from posterior extremity. *Excretory duct* opening slightly posterior to commencement of intestine.

Male, not seen.

Hab. Between the lower sheaths of leaves of oats from stubble-field, Broadmoor, Berks.

2. A. VILLOSUS, n. sp. (Plate X. figs. 99–101.)

Female, length $\frac{1}{51}''$, breadth $\frac{1}{1000}''$.

External Characters.—Body tapering very slightly anteriorly, but narrowing to a point posteriorly; shaggy from the presence of a hair-like fungus (?) growing on integument. Sucker (?). Head rounded, naked. Striæ transverse.

Spear $\frac{1}{2500}''$ long, simple. *Œsophagus* $\frac{1}{10}$th of total length; terminal muscular swelling $\frac{1}{2000}''$ in diameter. *Intestine* sparingly covered with granules. *Anus* $\frac{1}{1000}''$ from posterior extremity. *Vulva* at commencement of posterior third of body. *Excretory duct* opening at $\frac{1}{200}''$ from anterior extremity.

Male, length $\frac{1}{66}''$, breadth $\frac{1}{1000}''$.

Anus about the same position as in female. *Spicules* $\frac{1}{1666}''$ long, narrow, curved, slightly knobbed at upper extremities.

Hab. With *Plectus parietinus*, in tufts of moss (*Tortula*), Broadmoor, Berks.

3. A. PARIETINUS, n. sp. (Plate X. figs. 102, 103.)

Female, length $\frac{1}{36}''$, breadth $\frac{1}{833}''$.

External Characters.—Body pellucid, tapering very slightly forwards, but to a point backwards, where it appears to terminate in a sucker. Head almost truncate. Transverse striæ $\frac{1}{30000}''$ apart.

Spear simple, $\frac{1}{2000}''$ long. *Œsophagus* $\frac{1}{11}$th of total length; terminal swelling $\frac{1}{2000}''$ in diameter. *Intestine* covered by a few scattered granules; internal tube well seen. *Anus* $\frac{1}{770}''$ from posterior extremity. *Vulva* at commencement of posterior third of body. *Excretory duct* opening at $\frac{1}{266}''$ from anterior extremity.

Male, not seen.

Hab. With *Plectus parietinus*, in patches of yellow lichen (*Parmelia parietina*), Broadmoor, Berks.

4. A. PYRI, n. sp. (Plate X. figs. 103 *a*–103 *c*.)

Female, length $\frac{1}{43}''$, breadth $\frac{1}{1250}''$.

External Characters.—Body naked, pellucid, filiform, tapering slightly at both extremities; sucker doubtful. Head narrowed, rounded. Integumental striæ not visible.

Spear simple, $\frac{1}{2500}''$ long. *Œsophagus* $\frac{1}{10}$th of total length; terminal swelling large, $\frac{1}{2000}''$ in diameter. *Intestine* very sparingly covered with a few light-coloured granules.

Anus $\frac{1}{588}''$ from posterior extremity. *Excretory duct* opening opposite œsophageo-intestinal junction (?). *Lateral vessels* straight, not convoluted. *Vulva* at commencement of posterior third of body.

Male, about same size as female.

Anus $\frac{1}{666}''$ from posterior extremity. *Spicules* solitary, large, curved, $\frac{1}{1250}''$ long, somewhat knobbed at upper extremities.

Hab. Found by Dr. Cobbold in the decaying pulp of pears [1].

11. CEPHALOBUS [2], Bastian.

Gen. Char. *Body* tapering slightly at extremities. *Head* somewhat lobed. *Caudal sucker* none. *Integument* having well-marked transverse striæ; no setæ or papillæ. *Pharyngeal cavity* indistinct. *Œsophagus* narrowed previously to its termination in a rounded swelling containing a simple valvular apparatus. *Intestine* sparingly covered with light-coloured fat-particles; intestinal tube proper easily seen. *Vulva* at commencement of posterior third of body. *Uterus* unsymmetrical. *Spicules* slightly curved, somewhat fusiform. *Accessory piece* posterior, median, easily recognizable. *Excretory ventral gland* having a somewhat rigid, curved duct, opening opposite posterior third of œsophagus. *Lateral vessels* straight; terminations uncertain.

Movements sluggish.

1. C. persegnis, n. sp. (Plate X. figs. 104–106.)

Female, length $\frac{1}{34}''$, breadth $\frac{1}{555}''$.

External Characters.—Body white, tapering slightly anteriorly, and also posteriorly, where it is blunt and rounded. Head bilobed. Striæ transverse, distinct, $\frac{1}{10000}''$ apart.

Œsophagus between $\frac{1}{4}$th and $\frac{1}{5}$th of total length. *Intestine* slightly covered with a few light-coloured hepatic particles. *Anus* $\frac{1}{625}''$ from posterior extremity. *Vulva* at posterior third of body. *Excretory duct* opposite narrowed portion of œsophagus.

[1] In his work on "Entozoa," Dr. Cobbold, speaking of *Oxyuris vermicularis*, remarks:—"Respecting the migrations of the larvæ, I am not aware that anything very definite is yet known. I have introduced the eggs containing embryos into various animals, but have not yet succeeded in rearing young Oxyurides. I have also introduced them into the pulpy parenchyma of pears; but I have not been able to satisfy myself that any of the young Nematodes which I subsequently procured, by thousands, in one or two of the pears were the result of these experiments. I showed some of these living larvæ to Leuckart, who thought they might be *Anguillulæ*; and certainly I never saw the tadpole-like larvæ, as such, out of their shells. The young Nematodes in question displayed a very different form. As my experiments are in the act of being repeated, I will now say no more on this head" (pp. 369, 370).

I am indebted to the kindness of Dr. Cobbold for the opportunity of examining these animals, when I at once recognized two distinct species, belonging respectively to the genera *Aphelenchus* and *Plectus*. The representatives of the former genus, constituting the species above described, were by far the most numerous, though those of the genus *Plectus* were larger and much more active in their movements. The portion of pear-pulp sent to me was quite dry; but, after immersion in water for a few hours, I had no difficulty in verifying Dr. Cobbold's previous observations, and recognizing the little Nematodes in full activity, showing that they also are endowed with the same property of recovering after desiccation as are the other species of these genera. Dr. Cobbold did not recognize two distinct species; and thinking all the animals found in the pear-pulp were individuals of the same species, he proposed for it the name of *Anguillula pyri*, in a communication read before the last meeting of the BritishAssociation at Bath.

[2] κεφαλή, *the head*, and λοβός, *a lobe*.

Male, longer than female, but narrower; length $\frac{1}{31}''$, breadth $\frac{1}{625}''$.

Anus $\frac{1}{555}''$ from posterior extremity, which is altogether narrower than in the female. *Spicules* not distinctly visible, slightly curved, $\frac{1}{1000}''$ long. *Accessory piece* more distinct, straight, $\frac{1}{2000}''$ long.

Hab. Between the sheaths of leaves of wheat-stalks, from stubble-fields, Broadmoor, Berks.

2. C. STRIATUS, n. sp. (Plate X. figs. 107, 108.)

Female, length $\frac{1}{45}''$, breadth $\frac{1}{714}''$.

External Characters.—Body white, tapering anteriorly and posteriorly; posterior extremity proportionally narrower than in last species. Head bilobed. Striæ transverse, very distinct, $\frac{1}{10000}''$ apart.

Œsophagus $\frac{1}{4}$th of total length. *Intestine* sparingly covered with light-coloured hepatic particles. *Anus* $\frac{1}{500}''$ from posterior extremity. *Vulva* slightly anterior to posterior third of body. *Excretory duct* readily visible, $\frac{1}{270}''$ from anterior extremity.

Male, not seen.

Hab. Sandy soil, about rootlets of wheat, Broadmoor, Berks.

12. TYLENCHUS [1], Bastian.

Vibrio, Müller; *Anguillula*, Hemprich & Ehrenberg; *Rhabditis*, Dujardin.

GEN. CHAR. *Body* tapering at extremities. *Caudal sucker*, none. *Integument* having distinct transverse striæ; no setæ or papillæ. *Pharynx* modified into an exsertile *spear*, with a trilobed base. *Œsophagus* having a rounded muscular swelling about its middle; canal thread-like, continuous with spear, most distinct in anterior half. *Intestine* rather indistinct, sparingly covered with coarse, colourless fat-granules; intestinal tube proper easily recognizable. *Vulva* considerably posterior to middle of body. *Uterus* unsymmetrical; traces of abortive posterior median segment. *Spicules* rather stout, generally united to the posterior *accessory piece*. *Caudal alæ* in males membranous and unsupported by rays. *Duct* of excretory ventral gland linear, rigid, and curved at termination. *Lateral vessels* distinct, occasionally flexuous; terminations uncertain.

Movements sluggish.

The tenacity of life possessed by the members of this genus, as well as those of *Plectus*, *Aphelenchus*, and *Cephalobus*, is a most remarkable peculiarity, which may perhaps, in some slight degree, be accounted for by the structure of the integument, which seems calculated to enable them to resist actual desiccation and the evaporation of the natural moisture from their tissues for a much longer period than could be the case with other species, whose tegumentary organs are constructed upon a different principle. I have demonstrated by actual microscopical observation the presence of a plurality of integumental pores in the species of many genera; and all these animals (as well as many others, in which such pores have not been recognized, owing to the smallness of their size and the intrinsic difficulty of the investigation), when immersed in a dense medium,

[1] τύλος, *a knob*, and ἔγχος, *a spear*.

such as glycerine, almost immediately shrivel up, owing to the rapid osmosis of fluids from within; or, when placed in a colouring solution of magenta, the whole of their tissues become speedily and uniformly dyed of the same hue. But if a species of either of these four land and freshwater genera be submitted to the same conditions, they exhibit totally different results: they will continue to move about in glycerine for about fifteen or twenty minutes before commencing to shrivel, and will remain nearly as long in a strong magenta solution with the body uncoloured, save for a very short distance from the mouth and anus. Both these experiments seem to indicate that there is not such a free communication through the integument, in these species, between the internal parts of the body and the external medium, and that the integument is hermetically sealed, excepting at such natural apertures as mouth, anus, and vulva. This property may be one of the factors concerned in producing the extraordinary tenacity of life observed in these animals,—one of small significance, however, when we attempt to explain the very prolonged periods of suspended animation, extending over a series of years. This power of remaining for lengthened periods to all intents and purposes dead, inasmuch as there is a negation of all that we are apt to consider as the characteristic attributes of life, save that, like seeds, they still retain the potentiality of resuming their vital manifestations under the influence of suitable external conditions, must, doubtless, depend upon inherent peculiarities of the tissues themselves, beyond the reach of detection by optical instruments even of the highest power.

Another peculiarity of these four genera is the fact that they all possess the excretory gland in a modified condition, though I have not met with it at all in any of the other land and and freshwater types.

1. T. Davainii, n. sp. (Plate X. figs. 109–111.)

Female, length $\frac{1}{27}''$, breadth $\frac{1}{770}''$.

External Characters.—Body tapering at both extremities, especially towards posterior. Head narrowed, truncate. Integument thick; striæ transverse, distinct, $\frac{1}{1500}''$ apart.

Spear large, $\frac{1}{1428}''$ long. *Œsophagus* $\frac{1}{5}$th of total length; posterior part, behind median swelling, gradually widening. *Intestine* not very distinct from body generally, being obscured by large, coarse, colourless granules. *Anus* $\frac{1}{200}''$ from posterior extremity. *Vulva* considerably behind middle of body, $\frac{1}{40}''$ from anterior extremity. *Excretory duct* distinct, opening opposite posterior part of œsophagus, and extending backwards for about $\frac{1}{250}''$, where it terminates in an ovoid sac.

Male, same size as female.

Œsophagus shorter. *Anus* $\frac{1}{182}''$ from posterior extremity. *Spicules* rather narrow, $\frac{1}{714}''$ long; *accessory piece* of about half this length. *Alæ* transparent, narrow, extending, on either side, from slightly above to a little below the anus.

Hab. From sheet of moss covering large boulder lying in a freshwater stream, Falmouth.

2. T. triciti. (Plate X. figs. 112–114.)

Needham, Micr. 99, tab. v. 7.

Baker, Micr. Expl. 80, tab. v. fig. 9. 1, 2.

Roffredi, in Journal de Phys. 1775, p. 369.

Anguille vulgaire, Rozier, Obs. 1775, Mars, p. 218, tab. i. 7, et 1778, Nov. p. 401.
Anguille du blé rachitique, l. c. 1775, Janv. tab. i.
Anguille du faux ergot, l. c. 1776, Janv. p. 72, et Mars, pp. 372 et 436; Naturf. xxix. St. 40.
Spallanzani, Micr. 189. fig. 12 (pessima); idem, Opusc. Phys. ii. 354, tab. v. 10.
Eichhorn, Micr. 72, tab. vii. A.
Gleichen, Micr. 61, tab. xxviii. 6.
Spuhlwürmerälchen, Schrank, Beitr. 19; Würtemb. Wochenbl. 1782, p. 354.
Vibrio anguillula, γ. *Anguillula fluviatilis*, Müller, Anim. Infus. 65, tab. ix. 5–8.
V. tritici, Bauer, in Phil. Trans. 1823, i. 1–12, tab. i. et ii.—Versio in Ann. des Sc. Nat. (prem. sér.) ii. 154–167, cum tabula.—Bory, in Encycl. Méth. 1824, p. 779.—Dugès, in Ann. des Sc. Nat. (prem. sér.) ix. 225.—Henslow, in Microscopical Journal, 1841, p. 36.
Rhabditis tritici, Duj., Hist. Nat. des Helminthes, p. 242.
Anguillula graminearum, Diesing, Systema Helminthum, 1850, vol. ii. p. 132.
Anguillules de blé, Davaine, in Comptes Rendus, xli. (1855) 435–438 (de modo propagationis et immigrationis in semina frumenti).—Idem, ibid. xliii. (1856) 148, et in Institut, no. 1179 (1856) 281 (de tenacitate vitæ in individuis organis genitalibus adhuc destitutis).—Idem, Recherches sur l'Anguillule du blé niellé, Paris, 1857, avec 3 pl.

Female[1], length $\frac{1}{7}''$, breadth $\frac{1}{117}''$.

External Characters.—Body yellowish white, tapering rather abruptly forwards, but more gradually towards posterior extremity. Head rounded; no setæ or papillæ. Transverse striæ of integument not very distinct, $\frac{1}{20000}''$ apart.

Spear small, only $\frac{1}{2500}''$ long. *Œsophagus* about $\frac{1}{24}$th of total length; middle of swelling $\frac{1}{400}''$ from anterior extremity. *Intestine* much obscured by genital tubes, covered with irregularly arranged fat-particles. *Anus* $\frac{1}{250}''$ from posterior extremity. *Vulva* rather prominent, $\frac{1}{62}''$ from posterior extremity. *Anterior uterine segments* and *ovary* largely developed. *General cavity of body* filled with delicate parenchymatous or hyaline cells. *Excretory duct* opening at $\frac{1}{182}''$ from anterior extremity, and, in favourable specimens, visible for about $\frac{1}{80}''$ as a somewhat rigid, almost linear, curved tube. *Lateral vessels* most distinct, about $\frac{1}{3330}''$ in breadth, often much convoluted anteriorly[2].

Male, length $\frac{1}{11}''$, breadth $\frac{1}{312}''$.

Anus $\frac{1}{285}''$ from posterior extremity. *Spicules* rather broad, $\frac{1}{833}''$ long. *Accessory piece* connected with spicules, $\frac{1}{1428}''$ long. *Alæ* narrow, transparent, extending from $\frac{1}{666}''$ above anus to posterior extremity.

Hab. In gall-like growths, replacing germens in certain ears of wheat, also more rarely in those of oats and rye.

3. T. TERRICOLA, n. sp. (Plate X. figs. 115, 116.)

Female, length $\frac{1}{47}''$, breadth $\frac{1}{1250}''$.

External Characters.—Body pellucid, tapering slightly forwards, but more posteriorly. Striæ of integument transverse.

[1] Absolute measurements of both male and female rather variable; the relative measurements, however, remain pretty constant.

[2] These are not fixed to the parietes of the body in the same way as the axial tubes or vessels of the lateral lines in certain parasitic Nematoids, but float freely in the cavity of the body. When the integument of one of these animals is ruptured by pressure of the covering-glass under the microscope, I have several times seen whole coils of the vessels slip entirely out of the cavity of the body.

Spear $\frac{1}{2500}''$ long. *Œsophagus* $\frac{1}{6}$th of total length; centre of globate swelling $\frac{1}{454}''$ from anterior extremity. *Intestine* covered with rather coarse, scattered granules. *Anus* $\frac{1}{770}''$ from posterior extremity. *Vulva* slightly posterior to anterior $\frac{2}{3}$rds of body. *Excretory duct* opening opposite commencement of posterior third of œsophagus.

Male, not seen.

Hab. From sandy soil, adhering to rootlets of wheat-plant, Broadmoor, Berks.

4. T. OBTUSUS, n. sp. (Plate X. figs. 117, 118.)

Female, length $\frac{1}{29}''$, breadth $\frac{1}{770}''$.

External Characters.—Body tapering very slightly anteriorly, and still less posteriorly, where it is blunt and rounded. Head rather truncate. Striæ transverse, $\frac{1}{200000}''$ apart.

Spear $\frac{1}{1428}''$ long. *Œsophagus* $\frac{1}{14}$th of total length, having a globate swelling about its middle. *Intestine* sparingly covered with light-coloured granules. *Anus* $\frac{1}{435}''$ from posterior extremity. *Vulva* near commencement of posterior third of body. *Excretory duct* opening slightly posterior to middle of œsophagus.

Male, length $\frac{1}{33}''$, breadth $\frac{1}{770}''$.

Anus $\frac{1}{500}''$ from posterior extremity. *Spicules* $\frac{1}{1000}''$ long. *Accessory piece* about half as long, posterior, median. *Alæ* membranous and transparent, extending on either side from a little above anus to posterior extremity.

Hab. Sandy soil, about the rootlets of oats, Broadmoor, Berks.

5. T. DIPSACI, Kühn.

Anguillula Dipsaci, J. Kühn, in Schles. Jahresber. 1857, pp. 50–53.—Idem, in Zeitsch. für Wissensch. Zool. ix. (1857) 129–137, tab. vii. C.—Diesing, Sitzungsb. der Kais. Akad. Bd. xlii. (1861) p. 628.

"*Corpus* antrorsum attenuatum transparens. *Caput* obtusum, rotundatum. *Cauda* sensim acuminata recta v. paulo incurvata. *Apertura genitalis* feminea retrorsum sita. *Ovipara.* Longit. corp. $\frac{1}{2}$–$\frac{2}{3}'''$, crassit. $\frac{1}{8}$–$\frac{1}{6}'''$; longit. caudæ maris (a pene) $\frac{1}{15}$, feminæ (a vulva) $\frac{1}{5}$ corporis longitudinis."

"*Œsophagus* postice bulbosus."

"*Hab.* In anthodiis depravatis Dipsaci fullonum, Junio (*Kühn*)."

6. T. AGROSTIDIS.

Vibrio graminis, Steinbuch, in Naturf. xxviii. St. p. 233, tab. v., et ejus Analecten, 97, 135, tab. ii. figs. 1–6. *Anguillula graminearum* (in part), Diesing, Syst. Helminth. ii. p. 132.

It seems to me most probable that this species is distinct from *Tylenchus tritici*; the determination of this question, however, must be left to future observers.

13. RHABDITIS, Dujardin.

Anguillula, Grube.

GEN. CHAR. *Body* tapering at extremities. *Caudal sucker* none. *Integument* having longitudinal as well as transverse striæ; setæ none; papillæ none. *Pharyngeal cavity* long cylindrical. *Œsophagus* distinctly muscular, having two swellings,

one elongated near its middle, and the other terminal, rounded, and containing a simple valvular apparatus. *Intestine* rather sparsely covered with fat-particles, the large containing cells of which can sometimes be recognized. *Vulva* near the middle of body. *Uterus* bifid, segments symmetrical. *Oviparous* or *viviparous*. *Spicules* of moderate size, slightly curved. *Accessory piece* single, posterior, median, about half as long. *Caudal alæ* lateral, membranous, supported by sets of rays. *Ventral gland* wanting. *Lateral vessels* or *cellular canals* not seen.

Movements active.

Although I have looked very carefully for them, I have been unable to distinguish either lateral vessels or the ventral excretory gland in any of the representatives of this genus.

The typical *Rhabditis terricola* of Dujardin seems undoubtedly to correspond as regards structural details with the other species that I have placed in this genus; and, since it is now evident that Dujardin associated with this animal others of such diverse types as *Anguillula aceti* and *Tylelenchus tritici*, we shall have the less difficulty in imagining that he may have confounded with them also members of the genus *Plectus*, not only because they seem to be much more abundant than are the proper representatives of the genus *Rhabditis*, but also because he speaks of the latter as possessing that remarkable tenacity of life which belongs to species of the two former genera, when, as far as my experience goes, it is not possessed by the real allies of the typical *Rhabditis terricola*.

1. R. MARINA, n. sp. (Plate X. figs. 60–62.)

Female, length $\frac{1}{9}''$, breadth $\frac{1}{161}''$.

External Characters.—Body tapering considerably anteriorly, but more posteriorly, where it narrows to a point. Head truncate, naked. Integument having transverse and longitudinal striæ, those of each set being about $\frac{1}{10000}''$ apart.

Pharyngeal cavity cylindrical, $\frac{1}{1111}''$ long. *Œsophagus* $\frac{1}{9}$th of total length, containing in its terminal enlargement a valvular apparatus, which may be seen to open and shut with spring-like rapidity for the passage of fluids. Posterior part of œsophagus and anterior portion of intestine fixed to parietes by distinct muscular retinacula. *Intestine* much larger at commencement than terminal part of œsophagus; covered sparsely with fat-particles, the containing cells of which can occasionally be recognized. *Anus* $\frac{1}{166}''$ from posterior extremity. *Vulva* slightly posterior to middle of body. *Uterus* bifid; segments symmetrical, large, and densely distended with freely moving young and ova in all stages of development. *Ova* $\frac{1}{400}''$ long, by $\frac{1}{666}''$ broad. *Gland-system* very slightly developed; but numerous floating gland- or blood-cells in cavity of body, the maximum size being about $\frac{1}{1666}''$ in diameter[1].

Male, length $\frac{1}{12}''$, breadth $\frac{1}{200}''$.

Anus $\frac{1}{285}''$ from posterior extremity. *Genital tube* consisting of a single testicle,

[1] I have observed (in the female only) what appear to be two lateral apertures through the integument, connected with an obscure appearance of oval vesicles or dilatations internally, situated exactly midway between the anus and posterior extremity.

divided by a narrow constricted portion from the broad vas deferens. *Spicules* and *accessory piece* united together; segments of former $\frac{1}{454}''$ long. *Spermatozoa* cylindrical, $\frac{1}{5000}''$ long, having slow oscillating movement. *Alæ* two, composed of a hyaline membrane extending on each side from $\frac{1}{285}''$ above anus to posterior extremity, supported by nine rays in sets of one, two, and three.

Hab. Marine, in sand from tide-pools, Falmouth.

2. R. LONGICAUDATA, n. sp. (Plate X. figs. 63, 64.)

Female, length $\frac{1}{14}''$, breadth $\frac{1}{222}''$.

External Characters.—Body white, tapering gradually anteriorly, but more abruptly towards the posterior extremity, which is long and filiform. Head truncate, naked. Integument with longitudinal striæ, $\frac{1}{10000}''$ apart; transverse not recognized.

Pharyngeal cavity cylindrical, $\frac{1}{1000}''$ long by $\frac{1}{5000}''$ broad. *Œsophagus* $\frac{1}{7}$th of total length. *Intestine* very broad at commencement, before it is compressed by genital organs; covered by only a very few scattered fat-particles. *Anus* $\frac{1}{100}''$ from posterior extremity. *Vulva* very slightly anterior to middle of body.

Male, not seen.

Hab. Sandy soil about roots of wheat, Broadmoor, Berks.

3. R. ORNATA, n. sp. (Plate X. figs. 65–67.)

Female, length $\frac{1}{22}''$, breadth $\frac{1}{500}''$.

External Characters.—Body white, tapering anteriorly, but more posteriorly, where it is filiform. Head truncate, naked. Integument very transparent, with transverse striæ $\frac{1}{20000}''$ apart; longitudinal not recognized.

Pharyngeal cavity $\frac{1}{1111}''$ long. *Œsophagus* about $\frac{1}{6}$th of total length. *Intestine*, just at commencement, devoid of hepatic granules; remaining portion sparingly covered with large and rather dark-coloured particles. *Anus* $\frac{1}{200}''$ from posterior extremity. *Vulva* exactly in centre of body.

Male, length $\frac{1}{23}''$, breadth $\frac{1}{555}''$.

Anus $\frac{1}{400}''$ from posterior extremity. *Spicules* not very broad, slightly curved, $\frac{1}{588}''$ long, and connected with a posterior median accessory portion of one-half the length. *Alæ* lateral, same as in *R. marina*.

Hab. Between sheaths of leaves, stalks of wheat in stubble-fields, Broadmoor, Berks.

4. R. ACRIS, n. sp. (Plate X. figs. 68–70.)

Female, length $\frac{1}{35}''$, breadth $\frac{1}{666}''$.

External Characters.—Body white, tapering forwards and also towards posterior extremity, which terminates in a sharp point. Head truncate. Integument with transverse striæ, $\frac{1}{20000}''$ apart; longitudinal not seen.

Pharyngeal cavity $\frac{1}{2000}''$ long. *Œsophagus* about $\frac{1}{5}$th of total length. *Intestine* covered with few but large and dark-coloured hepatic granules. *Anus* $\frac{1}{294}''$ from posterior extremity. *Vulva* slightly posterior to middle of body.

Male, length $\frac{1}{41}''$, breadth $\frac{1}{909}''$.

Anus $\frac{1}{714}''$ from posterior extremity. *Spicules* double, $\frac{1}{1250}''$ long, united to a post-

median *accessory piece* of one-half the length. *Alæ* on each side of tail, supported by nine minute rays, same as in other species [1].

Hab. Sandy soil about the rootlets of wheat, Broadmoor, Berks.

5. R. TERRICOLA, Dujardin.

Angiostomum terricola, Diesing, in Syst. Helminth. ii. p. 139.

"Corps blanc, fusiforme, allongé, quinze fois environ aussi long que large; tête large de $0^{mm}{\cdot}016$; bouche suivie d'un pharynx prismatique, long de $0^{mm}{\cdot}03$; œsophage long de $0^{mm}{\cdot}13$ à $0^{mm}{\cdot}2$, *renflé en fuseau*, large de $0^{mm}{\cdot}033$ au milieu, élargi de nouveau en arrière pour se continuer avec le ventricule beaucoup plus large (de $0^{mm}{\cdot}04$ à $0^{mm}{\cdot}045$).

"*Mâle* long de $0^{mm}{\cdot}50$ à $1^{mm}{\cdot}05$, large de $0^{mm}{\cdot}025$ à $0^{mm}{\cdot}07$; queue courte, un peu courbée, terminée en pointe fine, et munie en dessous de deux ailes latérales, soutenues par sept à huit côtes chacune; anus à $0^{mm}{\cdot}04$ de l'extrémité; deux spicules, longs de $0^{mm}{\cdot}06$.

"*Femelle* longue de $0^{mm}{\cdot}5$ à 2^{mm}, large de $0^{mm}{\cdot}025$ à $0^{mm}{\cdot}10$; queue droite, amincie et prolongé en pointe fine plus ou moins longue; anus à $0^{mm}{\cdot}14$, au moins, de l'extrémité; vulve située vers le milieu; utérus très-large, musculeux au-dessus de la vulve, puis divisé en deux branches opposées; œufs elliptiques, longs de $0^{mm}{\cdot}05$ à $0^{mm}{\cdot}06$, contenant un embryon replié trois fois.

"Cet helminthe, si remarquable par sa structure, ne l'est pas moins par son habitation dans la terre humide et parmi les mousses, où il peut subir une dessication complète sans périr, et d'où il est entraîné par la pluie dans les fossés et les rivières. Il passe ensuite comme nourriture dans l'intestin des limaces, et de là dans l'intestin de la grenouille rousse, qui dévore ces mollusques; ou bien il est avalé dans les eaux par les gastérostés et divers petits poissons. On le trouve enfin aussi dans les lombrics; mais là il paraît avoir pris naissance dans des masses de parenchyme, libres entre l'intestin et l'enveloppe musculeuse. Je l'ai vu plusieurs fois, soit à Paris, soit à Rennes, se développer en quantité prodigieuse et former des amas blanchâtres dans des vases où j'avais conservé des lombrics avec de la mousse et de la terre humide [2]. Je l'ai trouvé communément dans les plaques d'oscillaires qui se développent sur la terre humide et dans les touffes de mousses (*Bryum*) qui se trouvent sur le sol et même sur les murs."

"Les exemplaires que j'ai recueillis dans l'intestin des *Gasterosteus* sont longs de $1^{mm}{\cdot}55$; leur queue est plus brusquement amincie ou subulée, longue de $0^{mm}{\cdot}07$; les œufs sont longs de $0^{mm}{\cdot}062$."

"J'ai trouvé fréquemment, soit dans la terre humide ou dans les eaux vaseuses, ou dans l'intestin des batraciens et des mollusques, divers *Rhabdites* qui diffèrent du précédent par leur œsophage cylindrique et non renflé en fuseau. Ce sont, 1°, des vers filiformes, longs de $0^{mm}{\cdot}25$, larges de $0^{mm}{\cdot}016$, dans les oscillaires à Paris; 2° des vers fusiformes, longs de $0^{mm}{\cdot}5$, larges de $0^{mm}{\cdot}026$, parmi les conferves, sur les murs humides des fontaines à Toulon; 3° des vers longs de $0^{mm}{\cdot}6$, larges de $0^{mm}{\cdot}3$, à queue obtuse, et ayant

[1] In the only male of this species observed by myself, there was a swelling or development of the integument around the head for a distance of $\frac{1}{1428}''$, somewhat similar to what is met with in *Oxyuris vermicularis*. Whether this will prove to be a constant character I cannot say.

[2] *Vide* note, p. 77.

l'œsophage étroit, long de $0^{mm}{\cdot}15$, parmi les oscillaires; 4° un ver long de $0^{mm}{\cdot}53$, large de $0^{mm}{\cdot}02$, ayant les baguettes du pharynx longues de $0^{mm}{\cdot}023$, et l'œsophage long de $0^{mm}{\cdot}08$, dans l'intestin du *Triton variegatus*, etc."

I have thought it best to give Dujardin's description and remarks concerning this species entire. From the great difference between the measurements given of this *Rhabditis terricola*, I think it very probable that Dujardin may not clearly have distinguished between two or more different species of this genus; whilst the animals referred to in his subsequent remarks, I have little doubt, belong to several totally distinct genera.

6. R. MUCRONATA.

Anguillula mucronata, Grube, in Wiegmann's Archiv, 1849, i. 361–365, tab. vii. 11–14 (cum anatom.).—Diesing, Syst. Helminth. ii. p. 557.

"*Extremitate* corporis antica lentius attenuata, truncata, bifariam e longitudine crenata, postica vix attenuata, fœmina rotundata, mucronata, maris in paleam maxime excavatam (costulis sustentam) desinente; œsophago postice bulboso, vulva in medio corpore sita. *Vivipara*. Longit. vix $\frac{1}{2}'''$; crassit. vix $\frac{1}{24}'''$."

"*Hab.* In terra humida cum lumbricis servata (*Grube*)."

MARINE.

14. SYMPLOCOSTOMA [1], Bastian.

Enoplus, Eberth; *Urolabes*, Carter.

GEN. CHAR. *Body* tapering at extremities. *Caudal sucker* well developed. *Integument* plain, or with longitudinal markings; setæ none (?). *Pharyngeal cavity* elongated, somewhat fiddle-shaped, having a peculiar funnel-shaped body lying along its inferior aspect, and an appearance of three or more circular lines around the parietes. *Œsophagus* gradually widening posteriorly, not distinctly muscular, embraced in some part of middle third by *glandular ring*. *Intestinal cells* large, well filled with dark-coloured granules; often very irregularly disposed in adult specimens. *Vulva* about middle of body. *Uterus* bifid; segments symmetrical. *Spicules* long, narrow. *Accessory piece* wanting. *Ocelli* present or absent. *Glandular system* well developed, especially at anterior and posterior extremities. *Excretory ventral gland* opening near anterior extremity; duct containing a granular fluid, and much contracted just before termination. *Lateral canals* . . . . . .

Movements active.

I have temporarily placed in this genus three species, which will, in all probability, have to be removed hereafter: the first is *S. vivipara*, about the exact structure of whose pharynx I have not had sufficient opportunity of satisfying myself; and the other two, evidently very closely allied, are *Enoplus ornatus* of Eberth and *Urolabes barbata* of Carter. These would appear not exactly to belong to this genus, but to a type very similar. Future observation must decide this point.

[1] *σύμπλοκος, complex*, and *στόμα, a mouth*.

1. S. LONGICOLLIS, n. sp. (Plate XI. figs. 119–122.)

Female, length $\frac{1}{8}''$, breadth $\frac{1}{250}''$.

External Characters.—Body smooth; anterior extremity tapering much, long, and narrow; posterior tapering more quickly. Caudal sucker well developed. Head truncate, naked. Integument with an appearance of longitudinal markings, $\frac{1}{6000}''$ apart.

Pharyngeal cavity somewhat fiddle-shaped, length $\frac{1}{1428}''$, having funnel and three circular markings. Two circular, highly refracting, colourless bodies (on œsophagus?) near termination of pharyngeal cavity. *Œsophagus* $\frac{1}{5}$th of total length. *Intestinal cells* large, from $\frac{1}{1000}''$ to $\frac{1}{500}''$ in diameter, containing an abundance of dark fawn-coloured granules, sometimes varying in shade in contiguous cells, and these themselves often very irregularly disposed. *Anus* $\frac{1}{118}''$ from posterior extremity. *Vulva* slightly posterior to middle of body. *Ocelli* none. *Glandular system* around middle third of œsophagus highly developed, and also at posterior extremity behind anus. *Excretory ventral duct* opening at $\frac{1}{300}''$ from anterior extremity.

Male, slightly larger than female.

Anus $\frac{1}{100}''$ from posterior extremity. *Spicules* long and narrow, very slightly curved, length $\frac{1}{172}''$.

Hab. From tide-pools, on *Cladophora rupestris* and other fine green and brown weeds on which Diatomaceæ abound, Falmouth and Brighton.

2. S. TENUICOLLIS.

Enoplus tenuicollis, Eberth, Untersuch. über Nematoden, 1863, p. 41, tab. iv. fig. 16, tab. v. figs. 1 & 2.

"*Körper* fast gerade, cylindrisch, gegen beide Enden ziemlich gleich stark verschmälert. Hinterende bei dem Weibchen gerade, bei dem Männchen eingerollt. Kopf quer abgestutzt. Schwanz mit einer grösseren Papille versehen."

"Länge des Weibchens 6 Mm., Breite 0·15 Mm.

"Länge des Männchens 4·5 Mm., Breite 0·09 Mm.

"Oesophaguslänge=$\frac{1}{5}$ der Körperlänge" [1].

3. S. VIVIPARA, n. sp. (Plate XI. figs. 123–125.)

Female, length $\frac{1}{12}''$, breadth $\frac{1}{294}''$.

External Characters.—Body tapering considerably at extremities, especially at posterior, which is long, filiform, and terminates with a minute sucker. Head slender, rounded, provided with a circlet of 6–8 spreading setæ. Integument with longitudinal markings about $\frac{1}{10000}''$ apart.

Pharyngeal cavity of a somewhat elongated-oval shape, containing no funnel or circular markings (?), $\frac{1}{1666}''$ in length. *Œsophagus* about $\frac{1}{6}$th of total length, gradually widening posteriorly, and embraced by a *glandular ring* at about its middle. *Intestine* irregularly and rather sparsely covered with somewhat large fat-particles. *Anus* $\frac{1}{117}''$ from posterior extremity. *Vulva* in centre of body. *Uterus* bifid. *Segments* symmetrical. *Viviparous. Excretory ventral gland* . . . . . ?

[1] Unless specified to the contrary, Eberth's species have been found at Nizza, amongst Algæ and Sertulariæ. In the description of this, as well as other species discovered by him, I have merely given the *external characters*. In his memoir, in addition to beautiful coloured drawings of each species, will be found lengthy descriptions, including many interesting and accurate anatomical details. It should be consulted by all interested in this subject.

Male, length $\frac{1}{17}''$, breadth $\frac{1}{370}''$.

Anus $\frac{1}{154}''$ from posterior extremity. *Spicules* $\frac{1}{400}''$ long, solitary, very slender, and slightly curved.

Hab. Fine surface-mud from marine estuary, Falmouth.

4. S. ORNATA.

Enoplus ornatus, Eberth, Untersuch. über Nematod. 1863, p. 40, tab. iv. figs. 13–15, tab. v. figs. 5 & 6.

"*Körper* fadenförmig, gegen beide Enden verschmälert. Vorderleib gerade, Hinterleib bei beiden Geschlechtern eingerollt, stärker bei dem Männchen als bei dem Weibchen. Kopf fast quer abgestutzt. Schwanz stumpfspitz mit feiner terminalen Oeffnung. Hinter dem Munde ist der Körper leicht eingeschnürt.

"Länge des Weibchens 4 Mm., Breite 0·125 Mm.

"Länge des Männchens 5 Mm., Breite 0·1 Mm.

"Verhältniss der Oesophaguslänge zur Körperlänge wie 1 : 4."

5. S. BARBATA.

Urolabes barbata, Carter, Ann. of Nat. Hist. ser. 3, vol. iv. (1859) p. 43, pl. iii. fig. 32.

"*Female*. Body the same as the last (*U. ocellata*), but much longer. Head furnished with four linear, short cirri. Tail short, somewhat curved, furnished with a short, pointed, digital termination. Mouth and anus the same. Vulva situated much posteriorly to the middle of the body, about the junction of the middle with the anterior third of the posterior half."

"Alimentary canal the same as in the foregoing species, but the intestinal sheath terminating less abruptly upon the commencement of the rectum. Hepatic organ the same. Organs of generation double, occupying the middle part of the body; their form undetermined. *Ocelli* at some distance from the head, of the same colour as in *U. infrequens*."

"*Size* $\frac{1}{7}$th inch long, and $\frac{1}{600}$th of an inch broad."

"*Male*, the same as the female; but with a large, thick, curved tail, obtuse at the extremity, tuberculated in its inner curvature, and furnished on each side with a row of short setæ, extending from above the anus towards the tip; also three or four setæ on the outer curvature. Testes and penis the same as in the foregoing species; form of the testes undetermined."

Hab. "Silty clots of Oscillatoria floating in the salt-water main drain of the town of Bombay."

15. ONCHOLAIMUS, Dujardin.

Enoplus, Diesing & M. Schultze.

GEN. CHAR. *Body* often elongated; posterior extremity blunt- or sharp-pointed. *Caudal sucker* variable, sometimes well developed, with 2 or 3 distinct sucker-tubes. *Integument* plain or with longitudinal markings; cephalic setæ generally present, and occasionally a few scattered over other parts of the body; cephalic papillæ wanting; integumental pores most distinct in mid-dorsal and ventral regions. *Pharyngeal cavity* large, ovoid, bounded by horny parietes, and having three longitudinal, slightly

curved, tooth-like projections from its inner surface. *Œsophagus* not distinctly muscular, cylindrical, and almost uniform in size; surrounded by a distinct *œsophageal ring*. *Intestine* mostly covered with olive-coloured particles, having a tessellated arrangement. *Vulva* at centre of body, or occasionally at posterior third. *Uterus* symmetrical or unsymmetrical. *Spicules* two, with or without a single *accessory piece*. *Ocelli* mostly wanting. *Excretory ventral gland* simple, tubular, extending from the anterior third nearly to the termination of œsophagus. *Lateral canals* often distinctly cellular.

Movements active.

This is not quite so natural an assemblage as those presented by some of the other genera, even after the freshwater species formerly included by Dujardin have been transferred to the genus *Mononchus*. In some members of this genus *Oncholaimus* the vulva is posterior, and the uterus unsymmetrical; and in some males also the spicules are solitary, whilst in one at least, *O. vulgaris*, there is a large and well-developed accessory piece. Owing to my not having found in several cases both the male and female representatives of the same species, I am unable to say, from my own observation, whether these alterations in the male and female organs are generally coincident, and constant enough to enable the species to be ranged under two distinct subgenera; and, unfortunately, the details concerning the anatomy of those discovered by other observers are too scanty to afford any assistance in the solution of this question. In two species also, *O. fuscus* and *O. albidus*, I have been unable to detect the usual œsophageal ring.

1. O. VULGARIS, n. sp. (Plate XI. figs. 126–128 *a*.)

Female, length $\frac{1}{2}''$, breadth $\frac{1}{143}''$.

External Characters.—Body elongated, cylindrical, tapering very slightly at extremities. Sucker well developed, with three large sucker-tubes occupying nearly the whole of the cavity of body posterior to anus. Head truncate, with a circlet of 4–6 short, stout setæ, and a few smaller ones scattered over anterior part of body. Integument thick, with an appearance of longitudinal markings $\frac{1}{5000}''$ apart; integumental pores distinct in mid-dorsal and ventral regions.

Pharyngeal cavity $\frac{1}{285}''$ long by $\frac{1}{666}''$ broad, having three strongly marked, slightly curved teeth projecting into cavity. *Œsophagus* about $\frac{1}{9}$th of total length, nearly uniform in size, having three longitudinal rows of pigment-granules; embraced at termination of anterior third by an *œsophageal ring*. *Intestine* broad, having a thick coating of olive-coloured hepatic granules, enclosed in cells, and presenting a distinct tessellated arrangement. *Anus* $\frac{1}{154}''$ from posterior extremity. *Vulva* slightly posterior to middle of body. *Uterus* bifid. *Excretory ventral gland* opening close to the œsophageal ring. *Lateral canals* distinct, cellular.

Male, length $\frac{4}{10}''$, breadth $\frac{1}{91}''$.

Anus $\frac{1}{250}''$ from posterior extremity. *Spicules* rather wider at middle, and tapering towards extremities, $\frac{1}{190}''$ long. *Accessory piece* single, somewhat triangular, $\frac{1}{454}''$ long by $\frac{1}{666}''$ broad at the base. A large mid-ventral prominent *sucker* $\frac{1}{154}''$ above anal cleft.

Hab. Amongst half-tide sand and stony débris very abundant, and also found once on a bright grass-green filiform weed (free from Diatomaceæ) from tide-pool, Falmouth.

2. O. GLABER, n. sp. (Plate XI. figs. 129, 130.)

Female, length $\frac{1}{25}''$, breadth $\frac{1}{833}''$.

External Characters.—Body tapering slightly forwards, but considerably towards posterior extremity, which is long, narrow, and pointed, and terminates with a minute sucker. Head rounded, naked. Integument plain or with longitudinal markings.

Pharyngeal cavity $\frac{1}{1666}''$ long. *Œsophagus* about $\frac{1}{4}$th of total length, embraced obliquely, near its middle, by an *œsophageal ring*. *Intestine* thinly covered with hepatic particles. *Anus* $\frac{1}{160}''$ from posterior extremity. *Vulva* about middle of body. *Excretory ventral duct* . . . . . .

Male, not seen.

Hab. Marine surface-mud from estuary, Falmouth.

3. O. VISCOSUS, n. sp. (Plate XI. figs. 131–133.)

Female, length $\frac{1}{13}''$, breadth $\frac{1}{714}''$.

External Characters.—Body long and filiform, scarcely at all narrowed anteriorly, but tapering gradually to a point at posterior extremity, which terminates with a minute sucker. Head bluntly rounded, provided with a circlet of four setæ. Integument plain or with longitudinal markings, having numerous fine particles of sand and diatoms adhering to its external surface.

Pharyngeal cavity $\frac{1}{1111}''$ long. *Œsophagus* $\frac{1}{7}$th of total length, embraced obliquely, near its middle, by an *œsophageal ring*. *Intestine* sparsely covered with hepatic particles. *Anus* $\frac{1}{222}''$ from posterior extremity. *Vulva* at middle of body. *Uterus* bifid.

Male, the same length as female, breadth $\frac{1}{833}''$.

Anus $\frac{1}{285}''$ from posterior extremity. *Spicules* solitary, of an elongated wedge-shaped form, and $\frac{1}{1000}''$ long.

Hab. Marine surface-mud from estuary, Falmouth.

When a thin layer of mud is spread out with water on a slip of glass, I have met with this species generally floating on the surface, appearing under a hand-lens as a slowly moving pellucid filament.

4. O. FUSCUS, n. sp. (Plate XI. figs. 139, 140.)

Male, length $\frac{1}{7}''$, breadth $\frac{1}{166}''$.

External Characters.—Body stout, of a brownish colour, tapering slightly forwards, but abruptly posterior to anus. Terminal sucker minute. Head narrow, rounded, having a circlet of 6–8 short, thick setæ at $\frac{1}{1250}''$ from anterior extremity. Integument having longitudinal markings; slightly tinged of a blackish colour at posterior extremity.

Pharyngeal cavity $\frac{1}{450}''$ long, large, elongated-oval; one tooth much larger than either of the other two. *Œsophagus* about $\frac{1}{6}$th of total length; slightly enlarged posteriorly; no *ring* visible. *Intestine* thickly covered with dark-brown hepatic particles; tessellation indistinct. *Anus* $\frac{1}{154}''$ from posterior extremity. *Spicules* long and narrow,

very dark in colour, hollow, $\frac{1}{143}''$ long; *accessory piece* wanting. *Excretory ventral gland* not recognized.

Female, not seen.

Hab. Marine surface-mud of estuary, Falmouth.

5. O. ALBIDUS, n. sp. (Plate XI. figs. 141, 142.)

Female, length $\frac{1}{4}''$, breadth $\frac{1}{166}''$.

External Characters.—Body elongated, whitish in colour, tapering anteriorly, but more towards posterior extremity; terminating in a moderate-sized sucker. Head truncate, provided with a circlet of four short, stout setæ, and a few smaller ones scattered over anterior part of body. Integument having longitudinal markings.

Pharyngeal cavity broadly ovate, $\frac{1}{588}''$ long. *Œsophagus* short, about $\frac{1}{10}$th of total length; enlarging slightly posteriorly; no *ring* seen. *Intestine* moderately well covered with rather light-coloured hepatic particles tessellated in arrangement. *Anus* $\frac{1}{100}''$ from posterior extremity. *Vulva* considerably behind middle of body, $\frac{1}{15}''$ from posterior extremity. *Uterus* unsymmetrical. *Ova* very large, in single file, occupying the whole width of the body, and somewhat flattened against its parietes. *Excretory ventral gland* opening far forward, at $\frac{1}{285}''$ from anterior extremity.

Male, not seen.

Hab. Amongst small stones and sand in tide-pools, Falmouth.

6. O. VIRIDIS, n. sp. (Plate XI. figs. 137, 138.)

Female, length $\frac{1}{9}''$, breadth $\frac{1}{333}''$.

External Characters.—Body of a light-greenish hue, tapering very slightly forwards, but somewhat abruptly behind anus, where it terminates with a pretty distinct sucker and sucker-tubes. Head truncated, provided with a circlet of 4–6 setæ; a few other smaller ones scattered over anterior part of body. Integument having longitudinal markings.

Pharyngeal cavity broad anteriorly, $\frac{1}{833}''$ long. *Œsophagus* about $\frac{1}{6}$th of total length, uniform in size, embraced obliquely by *ring* near its middle; having a collection of pigment immediately behind pharynx somewhat resembling an *ocellus*. *Intestine* well covered with hepatic particles having a distinctly tessellated arrangement. *Anus* $\frac{1}{285}''$ from posterior extremity. *Vulva* prominent, considerably behind middle of body, $\frac{1}{31}''$ from posterior extremity. *Uterus* unsymmetrical.

Male, not seen.

Hab. Small filamentous green weed from tide-pool, Falmouth.

7. O. ATTENUATUS, Dujardin. (Plate XI. figs. 134–136.)

Enoplus attenuatus, Diesing, Syst. Helminth. ii. p. 125.

Female, length $\frac{1}{10}''$, breadth $\frac{1}{435}''$.

External Characters.—Body long and slender, tapering very slightly at extremities, though most at posterior, which is somewhat blunt, and terminated by a well-marked sucker, with which are connected sucker-tubes. Head bluntly rounded, provided with a circlet of 6–8 setæ. Integument having longitudinal markings.

Pharyngeal cavity elongated, $\frac{1}{666}''$ in length. *Œsophagus* about $\frac{1}{8}$th of total length,

uniform in size, embraced by a *ring* near its middle, having three longitudinal lines of pigment more or less distinct, and two distinct local aggregations immediately behind pharynx (*pseudocelli*), varying in colour from brown to carmine. *Intestine* covered with hepatic particles having a tessellated arrangement. *Anus* $\frac{1}{285}''$ from posterior extremity; posterior boundary of anal cleft rather prominent. *Vulva* prominent, some distance behind middle of body. *Uterus* unsymmetrical. *Floating gland-cells* numerous, large, about $\frac{1}{3000}''$ in diameter. *Excretory ventral duct* opening far forwards, only $\frac{1}{400}''$ from anterior extremity, by a very narrow portion immediately following a small pyriform dilatation. *Lateral canals* of a green colour and granular, with the appearance of an axial channel.

Male, length $\frac{1}{11}''$, breadth $\frac{1}{500}''$.

Posterior extremity curved, shorter, more abruptly narrowed, and having two median setæ immediately above anal cleft. *Œsophagus* about $\frac{1}{5}$th of total length. *Anus* $\frac{1}{590}''$ from posterior extremity. *Spicules* almost straight, slender, $\frac{1}{833}''$ long; *accessory piece* wanting.

Hab. Found, with *Chromadora vulgaris*, *C. filiformis*, and *Cyatholaimus ocellatus*, on a stunted and dingy specimen of *Cladophora rupestris* from half-tide pool, Falmouth.

The specimens found by myself seem to agree so closely with the short description Dujardin has left us of his *Oncholaimus attenuatus*, as to make me think they must belong to the same species. The principal difference is that he mentions a "série de soies roides" above the anus in the male, whilst I have only recognized a single pair in this situation. His description is as follows:—"Corps filiforme, très-mince, cinquante fois aussi long que large; tête munie latéralement de deux ou quatre *soies courtes*; cavité buccale alongée, armée de trois pièces longitudinales, étroites, portant chacune une forte dent au milieu; *deux taches rouges* contiguées près du pharynx; œsophage long de $0^{mm}{\cdot}4$, large de $0^{mm}{\cdot}025$."

"*Mâle*, long de $2^{mm}{\cdot}4$, large de $0^{mm}{\cdot}045$; queue brusquement rétrécie en arrière de l'anus, recourbée en crochet et terminée par une sorte de papille (ou ventouse?); anus à $0^{mm}{\cdot}033$ de l'extrémité, accompagné d'une double *série de soies roides*; spicules longs de $0^{mm}{\cdot}03$."

"Dans l'eau de mer, entre les algues, à Lorient." (Hist. Nat. des Helminth. p. 236.)

8. O. PAPILLOSUS, Eberth.

Untersuch. über Nemat. p. 26, tab. i. figs. 13–17.

"*Körper* gestrickt, das Vorderende wenig verschmälert, quer abgestutzt. Das Hinterende des Weibchens gerade, in eine lange Spitze ausgezogen. Bei dem Männchen macht das Hintertheil eine leichte Krümmung gegen den Rücken, biegt sich aber dann mit der äussersten Spitze wieder gegen den Bauch.

"Länge des Weibchens 3 Mm., Breite 0·075.

"Oesophagus=ein Viertel der Körperlänge."

9. O. MEGASTOMA, Eberth.

Untersuch. über Nemat. p. 26, tab. i. figs. 18–20.

"*Körper* fast gerade, fadenförmig, gegen den Vorderleib wenig verschmälert Mund-

ende abgerundet, Schwanzende beim Männchen stark verdünnt, weniger bei dem Weibchen, leicht eingebogen."

" Weibchen 3 Mm. lang, 1 Mm. breit.

" Männchen 5–6 Mm. lang.

" Oesophagus=ein Sechstel der Körperlänge."

I have retained this species provisionally in the genus *Oncholaimus*, where it was placed by Eberth, though the representation he has given of this animal seems to indicate that it possesses a form of pharynx different, not only from that characteristic of the genus *Oncholaimus*, but also from that possessed by any other type that I have yet examined.

10. O. Echini, Leydig.

Müller's Archiv, 1854, p. 291.—Diesing, Sitzungsb. der Kais. Akad. Bd. xlii. (1861) p. 626.—Eberth, Untersuch. über Nemat. p. 25.

" *Corpus* utrinque attenuatum. *Os* dentibus pluribus instructum. *Ovipara.* Longit. 4‴."

" *Hab. Echinus esculentus*, in intestinis (*Leydig*)."

Probably swallowed accidentally; and it seems doubtful whether it really belongs to this genus.

11. O. rivalis, Leydig.

Müller's Archiv, 1854, p. 291, tab. xi. 89.—Diesing, Sitzungsb. der Kais. Akad. Bd. xlii. (1861) p. 626.—Eberth, Untersuch. über Nemat. p. 25.

" *Os* dentibus duobus lateralibus et tertio intermedio denticulato instructum. *Vivipara.* Longit. . . . . ."

" *Hab.* Sub saxis Meni frequenter (*Leydig*)."

If this really belongs to the genus *Oncholaimus*, it is the only freshwater species yet discovered.

16. ENCHELIDIUM, Ehrenberg.

" *Body* often 3–6 mm. long, straight or slightly curved. Head blunt, rounded off or truncate. Posterior extremity pointed, provided with a perforated sucker. Mouth plain, or with four small punctiform papillæ.

" *Skin* consisting of two or three layers, having, especially on fore part of body, several hairs implanted in its substance; larger cirrhi around the mouth. Behind the pharynx there opens on the ventral surface either a small gland or a tube reaching to commencement of intestine.

" An agglomeration of small cells in the place of tail-glands.

" Lateral lines simple, narrow, cellular cords.

" *Organs of Digestion.*—No pharynx. Œsophagus cylindrical, widening posteriorly; the external sheath finely granular, or transversely striped. Anus at the base of tail.

" *Organs of Generation.*—Two spicules, or a larger and a smaller pair, the latter being rather posterior.

" Bright ring around the œsophagus, which in one case appeared to be incomplete.

" *Ocelli.*—One large, ring-formed mass surrounding œsophagus, and having several lenses anteriorly."—*Eberth, Unters. über Nemat.* p. 23.

1. E. MARINUM, Ehrenberg.

Enchelidium marinum, Ehrenberg, Die Akaleph. d. roth. Meer, u. d. Organism. d. Medus. 1836, pp. 41, 57.—Dujardin, Hist. Nat. des Helm. p. 238.—Diesing, Syst. Helminth. ii. p. 127 (partim).—Oersted, De regione marinis, 1844, p. 69.

" *Corpus* capillare, extremitate caudali subulata. *Caput* corpore continuum, truncatum. *Os* terminale, orbiculare, cirrhatum? *Ocellus* pone os. *Penis* . . . .; feminæ apertura genitalis . . . . Longit. . . . .

" *Hab.* Inter mucosa palos marinos obvestientia, et in aqua marina servata frequentissime."

2. E. TENUICOLLE, Eberth.

Unters. über Nemat. p. 23, tab. iii. figs. 1–3.

" *Körper* des Männchens fast gleichmässig cylindrisch, mit Ausnahme des verdünnten Kopf- und Schwanzendes. Ersteres besonders im Cervicaltheile sehr dünn, nach vorn wieder etwas anschwellend, quer abgestutzt endigend. Das Hinterende zugespitzt mit durchbohrter Papille." . . . . .

" *Auge* im Cervicaltheil kurtz hinter der Mundöffnung, scheint ringförmig den Oesophagus zu umgeben, von schön brauner Farbe, enthält zwei kleine runde Linsen.

" *Länge* des Männchens 5 Mm., Breite 0·10.

" Oesophagus=ein Fünftel der Körperlänge."

3. E. ACUMINATUM, Eberth.

Unters. über Nemat. p. 24, tab. iii. figs. 4, 5.

" *Körper* des Männchens fast gerade, cylindrisch, nach unten wenig an Dicke zunehmend, wenig verschmälert gegen das Vorderende, das Hinterende leicht eingebogen, in eine feine Spitze auslaufend, die in eine durchbohrte Papille endigt. . . . . Hinter dem Pharynx ein schwarzbrauner birnförmiger Pigmenthaufen, dessen vorderer verschmälerter Partie drei grössere runde Linsen aufliegen . . . .

" *Länge* des Männchens 3 Mm., Breite 0·1.

" Oesophagus=ein Fünftel der Körperlänge."

4. E. SUBROTUNDUM.

Enoplus subrotundus, Eberth. Unters. über Nemat. p. 33, tab. ii. figs. 11, 12.

" *Körper* des Männchens fadenförmig, Hinterende zugespitzt mit feiner durchbohrter Endanschwellung, Vorderende wenig verschmälert, abgerundet, in einen rundlichen, vom übrigen Körper leicht abgesetzten Kopf geendigt.

" *Auge* gross länglichrund, hinter dem Pharynx gelegen, schön braun, mit einer grösseren kugligen centralen Linse.

" *Länge* des Männchens $5\frac{3}{4}$ Mm., Breite 0·1 Mm.

" Oesophaguslänge verhält sich zur Körperlänge wie 1 : 6."

5. E. Grubii.

Grube, Ausflug nach Triest und dem Quarnero, 1861.—Eberth, Unters. über Nemat., p. 22.

17. ANTICOMA[1], Bastian.

Odontobius, Eberth.

Gen. Char. *Body* tapering at extremities. *Caudal sucker* rather small; sucker-tubes undeveloped. *Integument* plain; short rows of opposite setæ on lateral aspects of anterior extremity; also cephalic setæ, and others more or less scattered over posterior part of body of males; papillæ absent. *Pharyngeal cavity* none. *Œsophagus* not distinctly muscular, widening posteriorly, surrounded by *ring* near its middle. *Intestine* mostly covered with rather pale granules having a tessellated arrangement. *Vulva* about middle of body. *Uterus* bifid. *Spicules* two, curved. *Accessory piece* wanting. *Supplementary organ* small, simple, tubular. *Ocelli* absent. *Vaginal glands* two, pyriform, equal; *anal* two, medium-sized, nucleated. *Excretory ventral gland* opening opposite anterior of œsophagus. *Lateral canals* narrow, cellular.
Movements moderately active.

1. A. Eberthi, n. sp. (Plate XI. figs. 143–145.)

Female, length $\frac{1}{4}''$, breadth $\frac{1}{166}''$.

External Characters.—Body whitish, slender, tapering considerably at extremities, especially at posterior, which is filiform. Head bluntly rounded, provided with a circlet of 6–8 well-marked setæ, whilst laterally, at a distance of $\frac{1}{666}''$ from anterior extremity, on each side, there is a row of 5 or 6 setæ extending at right angles from body. Integument plain.

Œsophagus $\frac{1}{8}$th of total length, gradually widening posteriorly, embraced by ring near its middle. *Intestine* well covered with light-coloured tessellated fat-particles. *Anus* $\frac{1}{91}''$ from posterior extremity. *Vulva* considerably anterior to middle of body, $\frac{1}{10}''$ from anterior extremity. *Uterus* bifid; segments symmetrical. *Anal glands* two. *Excretory ventral duct* opening opposite termination of anterior $\frac{1}{3}$rd of œsophagus.

Male, length $\frac{1}{5}''$, breadth $\frac{1}{200}''$.

Posterior extremity having a well-marked row of setæ in mid-abdominal region, above and below anus. *Anus* $\frac{1}{133}''$ from posterior extremity. *Spicules* curved, pointed, enlarged at upper extremities. *Supplementary organ* $\frac{1}{285}''$ above anal cleft, oblique, simple, tubular, $\frac{1}{1666}''$ long.

Hab. About the roots of *Corallina officinalis*, tide-pools, Falmouth.

2. A. limalis, n. sp. (Plate XI. figs. 146–148.)

Female, length $\frac{1}{10}''$, breadth $\frac{1}{227}''$.

External Characters.—Body whitish, tapering considerably anteriorly, and also at posterior extremity, which is rather long and filiform. Head slightly rounded, provided

[1] ἀντίος, *opposite*, and κόμη, *hair*, on account of the opposite rows of setæ on the lateral aspects of the cervical region.

with a circlet of 4–6 spreading setæ; opposite cervical hairs not recognized. Integument plain or with the appearance of longitudinal markings about $\frac{1}{9000}''$ apart.

Œsophagus $\frac{1}{5}$th of total length, gradually widening posteriorly, embraced by *ring* slightly in front of middle. *Intestine* covered with pale, regularly tessellated fat-cells. *Anus* $\frac{1}{118}''$ from posterior extremity. *Vulva* slightly posterior to middle of body. *Uterus* bifid. *Vaginal glands* two, equal, pyriform. *Excretory ventral gland* opening close to anterior extremity, at a distance from it of only $\frac{1}{1666}''$.

Male, not seen.

Hab. Marine surface-mud of estuary, Falmouth.

Not having seen the male of this species, I do not feel quite certain that it belongs to this genus.

3. A. PELLUCIDA, n. sp. (Plate XI. figs. 149, 150.)

Female, length $\frac{1}{9}''$, breadth $\frac{1}{222}''$.

External Characters.—Body tapering considerably forwards, posterior extremity long and filiform. Head slightly rounded, provided with 4–6 setæ; whilst laterally, at $\frac{1}{666}''$ from anterior extremity, on each side, is a row of six short equidistant setæ. Integument with an appearance of longitudinal markings $\frac{1}{7000}''$ apart.

Œsophagus about $\frac{1}{5}$th of total length, widening posteriorly, and embraced by *ring* slightly anterior to its middle. *Intestine* covered with light, distinctly tessellated hepatic particles. *Anus* $\frac{1}{105}''$ from posterior extremity. *Vulva* slightly anterior to middle of body. *Anal glands* two. *Excretory ventral duct* . . .

Male, not seen.

Hab. Small green weed from tide-pools, Falmouth.

4. A. ACUMINATA.

Odontobius acuminatus, Eberth, Unters. über Nemat. p. 28, tab. i. figs. 6–9.

"*Körper* des Wiebchens weisslich, gerade. Vorderende stark verschmälert, Mund leicht abgerundet, Hinterende stark verdünnt, in einen geraden pfriemenförmigen Schwanz auslaufend.

"*Körper* des Männchens, Hinterende wie beim Weibchen. Zwei paarige, gekrümmte, leicht blassgelbe Spicula, davor ein unpaares, stabförmiges, accessorisches Glied. . . . . .

"Weibchen 2·5 Mm. lang, 0·1 Mm. breit.

"Männchen 2 Mm. lang, 0·075 Mm. breit.

"Oesophagus=ein Drittel der Körperlänge."

18. PHANODERMA[1], Bastian.

Enoplus, Eberth.

GEN. CHAR. *Body* tapering at extremities. *Caudal sucker* well developed; sucker-tubes three, rather short. *Integument* plain, or with longitudinal markings, very transparent; cephalic *setæ* present; integumental pores well marked anteriorly, lateral.

[1] φανὸς, *bright* or *clear*, and δέρμα, *skin*.

Pharyngeal cavity indistinct, with obscure indications of three slightly coloured pharyngeal plates. *Œsophagus* not distinctly muscular, widening posteriorly, surrounded by a *ring*, and in its latter half having circular contractions of its sheath at intervals, giving its border a regular crenated appearance; three longitudinal rows of orange- or other coloured pigment-granules more or less marked along its whole extent. *Intestine* covered with somewhat olive-coloured fat-particles, having a tessellated arrangement. *Vulva* about middle of body. *Uterus* bifid; segments symmetrical. *Spicules* two, long and narrow; *accessory piece* wanting. *Supplemental organ* small, obliquely situated, tubular. *Ocelli* two, large, conical, bright red, situated laterally. *Parietal glands*, on muscles, well developed. *Excretory ventral gland* consisting of a short tube, with a blind dilated extremity, and opening by an abruptly narrowed duct near anterior extremity. *Lateral canals* distinctly cellular.

Movements active.

1. P. Cocksi[1], n. sp. (Plate XI. figs. 151–153.)

Female, length $\frac{1}{4}''$, breadth $\frac{1}{144}''$.

External Characters.—Body tapering very gradually forwards, but narrowing quickly to a point behind, where it terminates in a well-developed sucker. Head narrow, rounded, provided with a circlet of 6–8 setæ; a few others scattered over anterior part of body. Integument hyaline, with an appearance of longitudinal markings $\frac{1}{12000}''$ apart.

Pharyngeal cavity indistinct. *Œsophagus* about $\frac{1}{5}$th of total length, embraced by *ring* at termination of anterior third; having three rows of pigment, varying from orange-colour to olive-green, along its whole length; constrictions of posterior half at regular intervals, giving a crenated appearance to borders. *Intestine* well covered with a tessellation of hepatic particles. *Anus* $\frac{1}{143}''$ from posterior extremity. *Vulva* slightly posterior to middle of body. *Parietal glands* in œsophageal part of body very abundant. *Ocelli* two quite lateral, conical, bright-red pigment-masses. *Excretory ventral gland* opening by narrow duct, only $\frac{1}{250}''$ from anterior extremity, and terminating in a dilated extremity near the middle of œsophagus.

Male, length $\frac{1}{7}''$, breadth $\frac{1}{222}''$.

Anus $\frac{1}{200}''$ from posterior extremity. *Spicules* long, narrow, solitary; length $\frac{1}{125}''$. *Supplementary organ* tubular, not very distinct, slightly curved, $\frac{1}{666}''$ in length, and situated $\frac{1}{66}''$ above anus.

Hab. About the roots of Corallines in tide-pools, Falmouth.

2. P. albidum, n. sp. (Plate XI. figs. 154, 155.

Female, length $\frac{1}{7}''$, breadth $\frac{1}{250}''$.

External Characters.—Body white, tapering gradually at extremities, not suddenly at posterior, as in last; terminating in distinct sucker, with which are connected three sucker-tubes. Head narrowed, rounded, having a circlet of 6–8 spreading cirri. Integument very hyaline and transparent.

[1] Named after my dear and valued friend, W. P. Cocks, Esq., to whom science is much indebted for his researches into the marine zoology of Falmouth, resulting as they did in the discovery of so many new species of animals.

Pharyngeal cavity indistinct. *Œsophagus* $\frac{1}{5}$th and $\frac{1}{4}$th of total length, embraced by a *ring*; border of posterior half crenated. *Intestine* well covered with fat-particles, arranged in a tessellate manner. *Anus* $\frac{1}{154}''$ from posterior extremity. *Vulva* somewhat posterior to middle of body. *Ocelli* lateral, bright red, situated about $\frac{1}{666}''$ from anterior extremity. *Parietal glands* well developed. *Excretory ventral duct* . . . . . .

Male, not seen.

Hab. Small green sea-weed from tide-pools, Falmouth.

3. P. TUBERCULATUM, Eberth.

Enoplus tuberculatus, Eberth, Untersuch. uber Nemat. p. 38, tab. iv. figs. 1–5.

"*Körper* fast gerade, nach hinten anschwellend, nach vorn sich allmählich verschmälernd, mit quer abgestutztem Kopf. Schwanz kurz, wenig spitz, in eine durchbohrte Papille endigend. Das Männchen vor Beginn des Schwanzes stärker anschwellend . . . . . .

"Länge des Weibchens 5 Mm., Breite 0·2 Mm.

"Länge des Männchens $4\frac{1}{2}$ Mm., Breite 0·125 Mm.

"Oesophaguslänge verhält sich zur Körperlänge wie 1 : 3."

19. LEPTOSOMATUM[1], Bastian.

Phanoglene, Eberth; *Enoplus*, Eberth.

GEN. CHAR. *Body* elongated, filiform; posterior extremity blunt and rounded. *Caudal sucker* not prominent, provided with two or three long sucker-tubes. *Integument* plain or with longitudinal markings; lateral integumental pores well marked; setæ absent, or very few in number; cephalic papillæ wanting. *Pharyngeal cavity* wanting. *Œsophagus* not distinctly muscular, almost uniform in size, and surrounded anteriorly by an œsophageal *ring*. *Intestine* very scantily covered with small light-coloured fat-particles, sometimes almost altogether wanting. *Vulva* considerably posterior to middle of body. *Uterus* bifid; segments symmetrical (?). *Spicules* two, rather broad, but tapering at extremities. *Accessory pieces* two, posterior, somewhat cuneiform. *Supplemental organ* occasionally present. *Suckers* also occasionally present in male, above anus. *Ocelli* two, conical, red, almost lateral, having occasionally a transparent lens-shaped body imbedded in their substance anteriorly. *Excretory glands* two, lateral, opening on either side close to anterior extremity, and reaching nearly to posterior part of œsophagus. *Lateral canals* . . . . . .

Movements mostly slow and tardy.

I feel by no means certain that the animals here placed in this genus all really belong to the same type, and may not later require a rearrangement. The three species found by me undoubtedly present certain common characters, the most notable of which are the similarity in the shape of the male spicules and accessory pieces, as well as in the nature of the ocelli; but I have unfortunately been unable to ascertain whether *Leptosomatum gracile* and *L. figuratum* have the same double excretory glands as I have un-

[1] λεπτὸς, *slender*, and σῶμα, *a body*.

mistakeably made out in the typical species *L. elongatum*; in both these other two species I have as yet failed to detect any structure, either simple or double, answering to the excretory gland.

After a careful examination of Eberth's figures, however, I feel almost sure that his *Phanoglene punctata* presents the same type of structure[1] as my *L. elongatum*, and still more convinced that his *P. bacillata* is intimately allied to *L. gracile*. Whether belonging to this or more correctly to another, it is also evident that his *Enoplus coronatus* and my *L. figuratum* must be included in the same genus.

I have constituted this new genus, and removed from the genus *Phanoglene* the species placed in it by Eberth, on account of the improbability that these marine forms would agree in structure with the freshwater type of Nordmann's genus.

1. L. ELONGATUM, n. sp. (Plate XII. figs. 156, 157.)

Male, length $\frac{2}{5}''$, breadth $\frac{1}{200}''$.

External Characters.—Body cylindrical, filiform, tapering but very slightly at extremities. Sucker not prominent; sucker-tubes two, long, tubular, the terminations being blunt and rounded. Head slightly narrowed, rounded, naked. Integument plain; no striæ visible.

Œsophagus $\frac{1}{7}$th of total length, slender, nearly uniform in size, and free from pigment, surrounded by *ring* near end of anterior third. *Intestine* scarcely recognizable, from the almost total absence of hepatic particles. *Anus* $\frac{1}{285}''$ from posterior extremity. *Spicules* $\frac{1}{25}''$ long, broad in the middle, but tapering at extremities; *accessory pieces* $\frac{1}{1000}''$ long. *Ocelli* two conical carmine-coloured masses on dorsum of œsophagus, $\frac{1}{285}''$ from anterior extremity. *Excretory glands* two, tubular, extending along anterior two-thirds of œsophagus, and opening one on each side of head, $\frac{1}{1000}''$ from level of anterior extremity.

Female, not seen.

Hab. In a small dull-reddish sponge between crevices of stones from estuary, Falmouth.

2. L. PUNCTATUM.

Phanoglene punctata, Eberth, Untersuch. über Nemat. p. 20, tab. ii. figs. 5–7.

"*Körper* überall von fast gleicher Dicke, stärker verschmälert nach vorn, hinten in eine stumpfe Spitze auslaufend, leicht gegen den Bauch concav, mitunter auch stärker eingerollt. Das terminale Ende hier und da leicht nach unten eingebogen. Hinterende des Männchens etwas schmäler als das vom Weibchen. Mundöffnung eine leichte Grube, kurz hinter ihr auf der Bauch- und Rückenfläche zwei kleine Haare . . . . . .

"Weibchen 4·5 Mm. lang, 0·10 Mm. breit. Männchen 7·5–8 Mm. lang, 0·1 Mm. breit.

"Oesophagus=ein Fünftel der Körperlänge.

"*Hab.* Villafranca, unter Seepflanzen."

3. L. GRACILE, n. sp. (Plate XII. figs. 158–160.)

Female, length $\frac{1}{2}''$, breadth $\frac{1}{133}''$.

[1] Although he merely represents a terminal portion of one excretory gland, and does not depict its commencement anteriorly, I think he has very possibly overlooked the other, and also the lateral openings so close to the anterior extremity. This very unusual arrangement seems not to have been detected by him.

External Characters.—Body white, long, thread-like, tapering very slightly at extremities. Head rounded and, as well as rest of body, naked. Integument plain; pores very numerous and easily recognizable, especially in lateral regions of anterior extremity.

Œsophagus $\frac{1}{9}$th of total length, embraced by ring anteriorly, very slightly pigmented, and almost uniform in size. *Intestine* sparingly covered with small light-coloured granules more or less tessellate in arrangement. *Anus* $\frac{1}{182}''$ from posterior extremity. *Vulva* posterior to middle of body. *Uterus* bifid; segments symmetrical. *Ova* very large, occupying whole width of body. *Excretory glands* . . . . . *Ocelli* two, bright red, conical, on dorsum of œsophagus, $\frac{1}{222}''$ from posterior extremity.

Male, length $\frac{1}{3}''$, breadth $\frac{1}{182}''$.

Anus $\frac{1}{182}''$ from posterior extremity. *Spicules* $\frac{1}{333}''$ long, same shape as in *L. elongatum*; *accessory pieces* about half as long as spicules.

Hab. Same as *L. elongatum*.

4. L. BACILLATUM.

Phanoglene bacillata, Eberth, Unters. über Nemat. p. 19, tab. ii. figs. 1–4.

"*Körper* des Weibchens gerade, gegen die Mitte wenig anschwellend, beide Enden fast gleichmässig verdünnt, Vorderende leicht gerundet, quer abgestutzt, Hinterende stumpf, mit terminaler Oeffnung für die Schwanzdrüse. . . . . .

"Weibchen 8–9 Mm. lang, 0·1 Mm. breit.

"Oesophaguslänge=ein Fünftel des Körpers.

"*Hab.* Unter Corallen im Hafen von Nizza."

5. L. FIGURATUM, n. sp. (Plate XII. figs. 161–163.)

Female, length $\frac{1}{3}''$, breadth $\frac{1}{166}''$.

External Characters.—Body long, cylindrical, scarcely tapering at all at extremities, the posterior being blunt and rounded. Sucker well developed; sucker-tubes large. Head bluntly rounded, of a light yellowish colour for about $\frac{1}{666}''$ of an inch, and figured in a regular manner by bright lines; provided with a circlet of four short conical setæ. Integument with an appearance of longitudinal markings; integumental pores lateral.

Œsophagus about $\frac{1}{5}$th of total length, nearly uniform in size, embraced by *ring* about the termination of anterior third. *Intestine* rather slightly covered with light fat-particles not tessellately arranged. *Anus* $\frac{1}{285}''$ from posterior extremity. *Vulva* at commencement of posterior third of body. *Uterus* bifid; segments short, symmetrical. *Ocelli* two lateral, reddish brown, conical pigment-masses, each having a transparent lens-like body imbedded anteriorly. *Floating gland-cells* very large, oval, nucleated, often at regular distances on either side of body. *Excretory glands* indistinct; appearance of lateral openings at either side of head; nothing else recognized.

Male, very slightly smaller than female.

Anus $\frac{1}{285}''$ from posterior extremity. *Spicules* $\frac{1}{200}''$ in length; *accessory pieces* $\frac{1}{285}''$ long. *Supplementary organ* in the form of a horny sucker-like body, $\frac{1}{333}''$ above anus.

A series of nine hemispherical prominences above anus, on either side of middle line (suctorial papillæ).

Hab. About the roots of *Corallina officinalis*, and in sponge with *L. elongatum* and *L. gracile*, Falmouth.

6. L. CORONATUM.

Enoplus coronatus, Eberth, Unters. über Nemat. p. 37, tab. iii. figs. 13–19.

"*Körper* bei dem Weibchen fast gerade, stärker verschmälert gegen das Kopfende, weniger gegen den Schwanz.

"Kopf leicht abgerundet mit einer kleinen centralen Vertiefung, die zum Pharynx führt. Hinterende stumpf spitz, bei dem Männchen leicht eingerollt.

"Länge des Weibchens 5 Mm., Breite 0·20 Mm.

"Länge des Männchens 4–5 Mm., Breite 0·2 Mm.

"Oesophaguslänge verhält sich zur Körperlänge wie 1 : 5.

"*Hab.* Unter Corallen im Hafen von Nizza."

7. L. LONGISSIMUM.

Phanoglene longissimum, Eberth, Unters. über Nemat. p. 21, tab. ii. fig. 8.

"*Körper* des Weibchens eingerollt, nach unten anschwellend, Vorderende ziemlich schmal, Hinterende wenig verschmächtigt, stumpf.

"*Sinnesorgane.* In der Cervicalgegend zwei viereckige hellbraune Pigmentflecke ohne deutliche Linse.

"Weibchen 15 Mm. lang, $\frac{1}{4}$ Mm. breit.

"Oesophagus verhält sich zur Körperlänge wie 1 : 15.

"*Hab.* Unter Corallen im Hafen von Nizza."

8. L. SUBULATUM.

Phanoglene subulata, Eberth, Unters. über Nemat. p. 21, tab. ii. figs. 9 & 10.

"*Körper* des Weibchens in der äussern Form der vorigen Art (*L. longissimum*), mit Ausnahme des Schwanzes, ganz ähnlich. Dieser war hier sehr lang, pfriemenförmig und endete in eine schmale durchbohrte Papille.

"Länge etwa 8 Mm.

"*Hab.* Nizza."

This species seems to differ considerably from the others; and the form of the tail, with the presence of anal glands, as represented by Eberth, are sufficient to indicate the improbability of its really belonging to this genus.

20. ENOPLUS, Dujardin.

Lineola, Kölliker.

GEN. CHAR. *Body* tapering at extremities, especially towards posterior, which is more or less conical. *Caudal sucker* of moderate size, generally provided with three short sucker-tubes. *Integument* having transverse and longitudinal markings; pores most visible in mid-dorsal and ventral region; cephalic setæ generally present, and

others frequent about posterior extremity, especially in the male; cephalic papillæ often present. *Pharyngeal cavity* none or indistinct, but in its situation three distinct horny jaws or teeth, more or less bilobed at their extremities. *Œsophagus* not distinctly muscular, nearly uniform in size, often much stained with pigment, especially at the anterior part; no distinct œsophageal ring. *Intestine* well covered with dark pigment-granules often distinctly tessellate in arrangement. *Vulva* about middle of body. *Uterus* bifid; segments symmetrical. *Spicules* large, curved, and, together with two strong lateral *accessory pieces*, of a yellowish-brown colour. *Supplemental organ* of same colour, large, oblique, funnel-shaped. *Ocelli* (pseud.) occasional, owing to more distinct aggregation of the usual pigment-matter of œsophagus; sometimes on or external to œsophageal sheath (?). *Excretory ventral gland* tubular, opening about the termination of anterior third of œsophagus. *Lateral canals* distinctly cellular.

Movements moderately active.

This is a very interesting genus, inasmuch as it appears to reveal to us the most rudimentary condition of the ocelli, which are found more specially developed in the species of other genera, such as *Phanoderma* and *Leptosomatum*. Here we find, in several species, a simple local increase in the aggregation of the pigment, in two or three patches, on the anterior part of the œsophagus, it being also more or less scattered over its whole extent, whilst in *Enoplus inermis* it is wanting in all parts of the œsophagus, save in two rather distinctly defined ocelli-like masses, which seem, however, to be still situated beneath instead of on the sheath of the œsophagus, as is so evidently their situation in the genera above named.

In this genus also are included many species of free Nematodes which have been discovered by other observers, but whose real position and nature are still very doubtful, either from the insufficient or unsatisfactory nature of the details concerning them.

1. E. COMMUNIS, n. sp. (Plate XII. figs. 164–166.)

Female, length $\frac{1}{4}''$, breadth $\frac{1}{120}''$.

External Characters.—Body tapering slightly forwards, but considerably behind, where it terminates in a rather long pointed extremity, with a rounded sucker and three small divergent setæ. Head rounded, narrowed, provided with four crucially arranged papillæ, and behind them a circlet of 8–10 long patent setæ; a few small setæ scattered over anterior part of body also. Integument with almost imperceptible transverse striæ, about $\frac{1}{30000}''$ apart, and with an appearance of longitudinal markings also at a distance of $\frac{1}{8000}''$.

Pharynx indistinct. *Teeth* three, equal-sized, of a light fawn-colour, $\frac{1}{1000}''$ long, marked with minute longitudinal lines, and having their upper extremities somewhat bilobed. *Œsophagus* about $\frac{1}{8}$th of total length, having its canal indicated by a sinuous line, with irregular transverse markings of its walls at intervals, and a more or less abundant arrangement of minute olive-coloured pigment-granules, mostly collected in three longitudinal lines, with short irregular transverse offshoots or separate masses, most marked anteriorly just behind pharynx. *Intestine* thickly covered with dark-coloured fat-particles contained in rather large cells, the tessellated appearance being

distinct. *Anus* $\frac{1}{77}''$ from posterior extremity. *Vulva* slightly posterior to middle of body. *Excretory ventral gland* tubular, extending from posterior part of œsophagus to about the termination of anterior third.

Male, length $\frac{1}{4}''$, breadth $\frac{1}{100}''$.

Rather stouter than female, especially at posterior extremity; tail tapering more abruptly behind anus; small setæ scattered over posterior part of body; below anal cleft are two strong setæ, one on each side of middle line; and above, between it and supplementary organ, is a single median row of about sixteen longer and more slender bristles. Strong obliquely transverse markings of integument $\frac{1}{3500}''$ apart for some distance above anal cleft.

Spicules brownish yellow, strong, curved, $\frac{1}{100}''$ in length; *accessory pieces* of same colour, $\frac{1}{222}''$ long, slightly curved, and somewhat wedge-shaped. *Supplementary organ* $\frac{1}{66}''$ above anus, brownish yellow, large, infundibuliform, $\frac{1}{200}''$ long; internal expanded portion becoming thin and rather indistinct.

Hab. About the roots of *Corallina officinalis* from tide-pools, Falmouth.

2. E. Dujardinii, n. sp. (Plate XII. figs. 168–170.)

Female, length $\frac{1}{4}''$, breadth $\frac{1}{100}''$.

External Characters.—Body very pellucid, tapering slightly anteriorly, but considerably behind anus. Head narrowed, rounded, having four crucially arranged papillæ around mouth, and behind these a circlet of 10–12 strong patent setæ; no other setæ visible. Integument very transparent, with almost imperceptible transverse and also longitudinal markings.

Teeth three, same as in last. *Œsophagus* between $\frac{1}{6}$th and $\frac{1}{7}$th of total length; pigment-lines and markings well developed anteriorly, but no very distinct local aggregations. *Intestine* broad, densely covered with small, dark-coloured, tessellate aggregations of fat-particles only about $\frac{1}{2000}''$ in diameter. *Anus* $\frac{1}{60}''$ from posterior extremity. *Vulva* very slightly posterior to the middle of body. *Excretory ventral duct* opening opposite termination of anterior third of œsophagus.

Male, about same size as female, but slightly narrower. Posterior extremity terminating with three minute setæ; single median row of long narrow setæ between anus and supplementary organ; the two posterior to anus not present, neither were any small ones scattered over posterior part of body recognized.

Spicules brownish yellow, strong, curved, $\frac{1}{125}''$ long; *accessory pieces* about half as long. *Supplementary organ* $\frac{1}{77}''$ above anus, much longer, as compared with breadth of body, than in last species.

Hab. In sand and about roots of Algæ from tide-pools, Falmouth.

3. E. pigmentosus, n. sp. (Plate XII. figs. 171, 172.)

Female, length $\frac{1}{3}''$, breadth $\frac{1}{100}''$.

External Characters.—Body tapering slightly forwards; posterior extremity behind anus elongated, conical, terminating with distinct rounded sucker, but no setæ. Head bluntly rounded; mouth surrounded by four rather smaller papillæ; and behind them is

a circlet of about six strong spreading setæ; no setæ recognized on other parts of body. Integument transparent; striæ not recognized.

Teeth three, large, $\frac{1}{666}''$ in length. *Œsophagus* about $\frac{1}{7}$th of total length, abundantly marked with pigment arranged in three principal rows. *Intestine* densely covered with very dark-coloured and almost black pigment-granules; tessellate arrangement not very distinct. *Anus* $\frac{1}{160}''$ from posterior extremity. *Vagina* anterior to middle of body. *Ova* large. *Excretory ventral duct* opening opposite termination of anterior third of œsophagus.

Male, not seen.

Hab. About roots of Algæ and Corallines from tide-pools, Falmouth.

4. E. INERMIS, n. sp. (Plate XII. figs. 173–175.)

Female, length $\frac{1}{3}''$, breadth $\frac{1}{187}''$.

External Characters.—Body naked, tapering but very slightly anteriorly, though in the usual way towards posterior extremity, which terminates in a rather undeveloped sucker, in connexion with which the usual sucker-tubes were not recognized. Head bluntly rounded, or even somewhat angular; no papillæ; no setæ. Integument with faint transverse striæ, $\frac{1}{10000}''$ apart, and also indistinct longitudinal markings.

Teeth three, small, $\frac{1}{3333}''$ long, very close to mouth. *Œsophagus* about $\frac{1}{7}$th of total length, almost free from pigment, except anteriorly, where it is principally collected into two reddish-brown *ocelli-like* masses, about $\frac{1}{333}''$ from anterior extremity. *Intestine* well covered with dark pigment-granules; tessellation indistinct. *Anus* $\frac{1}{66}''$ from posterior extremity. *Vulva* posterior to middle of body. *Excretory ventral gland* could not be detected.

Male, length nearly the same as that of female, breadth $\frac{1}{143}''$. Head provided with four indistinct papillæ; posterior extremity broader than in female, and tapering more abruptly behind anus; two setæ below anus, small; no other seen.

Spicules brownish yellow, curved, obtuse at points, $\frac{1}{166}''$ long; *accessory pieces* of about half the length. *Supplementary organ* rather narrow, $\frac{1}{80}''$ above anus, and $\frac{1}{200}''$ in length.

Hab. In small red sponges from crevices of rock, Falmouth.

5. E. BREVIS, n. sp. (Plate XII. figs. 176, 177.)

Female, length $\frac{1}{5}''$, breadth $\frac{1}{143}''$.

External Characters.—Body scarcely tapering at all anteriorly, but considerably towards the posterior extremity, which is rather long and pointed, terminating in a distinct sucker; sucker-tubes not recognized. Head rounded, having no papillæ, but provided with a circlet of 10–12 setæ. Integument transparent, with very delicate transverse and longitudinal markings.

Teeth three, large, $\frac{1}{166}''$ in length. *Œsophagus* between $\frac{1}{5}$th and $\frac{1}{6}$th of total length; pigmentary deposits distinct almost to termination. *Intestine* well covered with dark-coloured fat-particles, having a tessellate arrangement. *Anus* $\frac{1}{80}''$ from posterior

extremity. *Vulva* posterior to middle of body. *Excretory ventral duct* opening at $\frac{1}{100}''$ from anterior extremity.

Male, not seen.

Hab. About roots of small Algæ and Corallines from tide-pools, Falmouth.

6. E. TRIDENTATUS, Dujardin.

Hist. Nat. des Helminthes, p. 233.

"Corps filiforme, gris-brunâtre, long de 3 à 7^{mm}, large de 0^{mm}·11 à 0^{mm}·23, trente à trente-cinq fois aussi long que large; tête anguleuse, large de 0^{mm}·06, portant latéralement quelques soies roides, opposées; bouche ronde, entourée par le tégument mou, et armée intérieurement de trois mâchoires cornées, symétriques; mandibules longues de 0^{mm}·046, formées d'une apophyse postérieure, plus étroite, élargies et bilobées en avant, où elles se terminent par une dent crochue interne; œsophage musculeux, long de 0^{mm}·9, large de 0^{mm}·063, avec des bandes transverses de pigment brun-rougeâtre; deux amas de pigment rouge (taches oculiformes?) à l'origine de l'œsophage; canal œsophagien triquêtre, à bord flexueux; intestin revêtu de plaques aréolées brunâtres (foie?); tégument formé d'un épiderme épais de 0^{mm}·0017, et de huit à neuf couches d'une substance diaphane élastique.

"*Mâle* ayant la partie postérieure du corps hérissée de quelques soies éparses; queue assez brusquement amincie, large de 0^{mm}·02, à l'extrémité; orifice génital (et anal?) à 0^{mm}·31 de l'extrémité; un autre orifice (anus ou ventouse?) situé à 0^{mm}·35 en avant; spicules épais, longs de 0^{mm}·15, courbés en faucille et dentelés vers l'extrémité; pièce accessoire longue de 0^{mm}·048, embrassant l'extrémité des spicules.

"*Femelle* à queue plus longue et moins brusquement amincie; anus à 0^{mm}·47 de l'extrémité; vulve orbiculaire, située en avant du milieu.

"Je l'ai trouvé fréquemment entre les algues marines à Toulon, et à Cette dans la Méditerranée, et dans l'étang de Thau, et à Saint-Malo dans l'Océan."

7. E. STENODON, Dujardin.

Hist. Nat. des Helminthes, p. 234.

"Corps long de 2^{mm} à (?), large 0^{mm}·04 à (?), cinquante fois environ aussi long que large; tête large de 0^{mm}·013, munie de quelques soies roides, latérales; bouche armée intérieurement de trois dents étroites, sinueuses, longue de 0^{mm}·012: une tache rouge bien nette sur l'œsophage, à 0^{mm}·03 de la bouche; queue épaisse, amincie peu à peu; anus à 0^{mm}·07 de l'extrémité.

"Dans l'eau de mer entre les algues, à Lorient."

8. E. ELONGATUS, Dujardin.

Hist. Nat. des Helminthes, p. 234.

"Corps long de 18^{mm}, large de 0^{mm}·2, quatre-vingt-dix fois aussi long que large; tête large de 0^{mm}·06, tronquée et munie de soies latérales roides, assez longues; bouche armée intérieurement de deux ou trois pièces (mâchoires) coudées, à angle droit en avant et en dedans, et dentelées en avant.

"Dans l'eau de mer, à Saint-Malo."

9. E. MICROSTOMUS, Dujardin.

"Corps proportionnellement assez épais, long de $2^{mm}\cdot6$, large de $0^{mm}\cdot10$, vingt-six fois aussi long que large, aminci seulement aux extrémités; tête amincie brusquement et large $0^{mm}\cdot016$ en avant, et entourée de quelques soies roides; bouche armée intérieurement de trois pièces (mâchoires ?) prolongées par des apophyses étroites en arrière; deux taches rouges bien nettes et bien séparées, à $0^{mm}\cdot06$ de la bouche; queue courte, assez brusquement amincie.

"Dans l'eau de mer, à Lorient."

10. E. MACROPHTHALMUS, Eberth.

Unters. über Nemat. p. 35, tab. ii. figs. 23, 24, tab. iii. fig. 6.

"*Körper* des Weibchens fast gerade, gegen das Vorderende wenig verschmälert, das Schwanzende stärker zugespitzt und in eine kleine durchbohrte Anschwellung endigend.

"Kopf abgerundet mit einem mittleren rundlichen Vorsprung und 2 kleinen seitlichen Papillen.

"Zwei grosse braune Pigmentflecken hinter dem Pharynx.

"Weibchen 5 Mm. lang, 0·20 Mm. breit.

"Oesophaguslänge=$\frac{1}{5}$ Körperlänge."

11. E. OBTUSICAUDATUS, Eberth.

Untersuch. über Nemat. p. 36, tab. iii. figs. 7 & 8.

"*Körper* des Weibchens.—In seiner äusseren Form ist er von dem vorigen verschieden durch die allmähliche und geringe Verschmälerung des Vorderendes und durch den stumpfen Schwanz, welcher nach oben eine mehr concave und nach unten eine mehr convexe Fläche bildet. Am Schwanze eine terminale nur leicht prominirende Mündung der Schwanzdrüse.

"Hinter dem Pharynx zwei quergelagerte dunkelbraune Augenflecke.

"Länge des Weibchens 3 Mm., Breite 0·125 Mm.

"Oesophaguslänge=$\frac{1}{6}$ der Körperlänge."

12. E. STRIATUS, Eberth.

Unters. über Nemat. p. 36, tab. ix. figs. 9–12.

"*Körper* fast gerade, fadenförmig, in der Mitte angeschwollen, gegen die beiden Enden verschmälert, stärker gegen den Schwanz; dieser bei dem Männchen leicht eingebogen. Vorderende stumpf abgerundet, mit einem kleinen trichterförmigen Mund. Der Körper hinter dem Pharynx auf eine kurze Strecke leicht eingeschnürt . . . . . .

"Hinter dem Pharynx zwei braune nierenförmige Pigmenthaufen.

"Länge der Männchen 3 Mm., Breite 0·125 Mm.

"Oesophaguslänge=$\frac{1}{6}$ der Körperlänge."

13. E. OCULATUS, Diesing.

Revision der Nematoden, Sitzungsb. der Wien. Akad. 1861, Bd. xlii. no. 28, p. 625.
Anguillula oculata, Oersted, De region. marin., 1844.

"Ocelli duo brunnei."

"*Hab.* In profunditate 11–∞ orgyarum, Kullen in fretu Öresund, æstate (*Oersted*)."

14. E. Leydigii, Eberth.

Müller's Archiv, 1851, p. 292.—Eberth, Unters. über Nemat. p. 32.

"Der Wurm ist fadenförmig, $1\frac{1}{2}$–2‴ lang, das Kopfende breiter als das Schwanzende. Die cuticula stark quergeringelt, besonders im vorderen Drittheil des Körpers, und jeder Ring erscheint wieder für sich längsgestrichelt.

"Kopf querabgestutzt, vorderer Rand wie lippenartig, mit mehren seichten Einkerbungen und mit vereinzelten blassen Borsten besetzt. Der Lippentheil des Kopfes ist hell, sonst hat der Wurm bei durchfallendem Lichte eine bräunliche Farbung. Die Mundhöhle hat innen zwei seitliche gezähnelte Leisten und eine unpaare mittlere kleinere. Schundröhre nach hinten leicht kolbig angeschwollen, dickwandig, quergestreift mit innerer Cuticula. Darm gerade. Anus an der Schwanzbasis. Im Anfang des Oesophagus zwei rothbraune augenähnliche Flecke. Zwei entgegengesetzt verlaufende Eierstöcke, gemeinsamer Uterus, Vagina in der Mitte des Körpers. Das Männchen vor dem Schwanzende auf dem Rücken mit Borsten besetzt. Es scheinen zwei Spicula vorhanden. Schwanzdrüse bei beiden Geschlechtern durch ein kurzes Röhrchen mündend." —*Eberth.*

15. E. Sieboldii, Eberth.

Untersuch. über Nemat. p. 31.

Lineola Sieboldii, Kölliker, Abdrück aus den Verhand. d. Naturf. Gesellch. 1845.

"Der Leib ist bräunlich, vorn und hinten weiss, 3–5‴ lang. Von den Fühlern vier sehr kurtz, zwei etwas länger, alle endständig. Mundhöhle mit kleinen zahnartigen Hervorragungen besetzt; am Kopfe dicht am Oesophagus zwei oder drei Flecken (Augen ?). Scheideöffnung mit zwei oder drei kleinen zahnartigen Vorsprüngen versehen. Schwanz 0·1‴ lang; Penis 0·1‴ lang."

16. E. cirrhatus, Eberth.

Untersuch. über Nemat. p. 34, tab. ii. fig. 20–22, tab. iv. fig. 17, & tab. v. fig. 4.

"*Körper*: bei dem Weibchen am Hinterleib gegen den Bauch leicht eingebogen, stärker eingerollt bei dem Männchen, beide Enden verschmälert, der Schwanz zugespitzt, das Vorderende etwas abgerundet. Schwanz in eine kurze durchbohrte Spitze auslaufend . . . . . .

"Länge des Weibchens 4 Mm., des Männchens $3\frac{1}{2}$ Mm.

"Breite des Weibchens 0·12 Mm., des Männchens 0·1 Mm.

"Oesophaguslänge $=\frac{1}{6}$ der Körperlänge."

This certainly is not an *Enoplus*; the type is distinct, though unknown to me.

17. E. cæruleus, Eberth.

Untersuch. über Nemat. p. 39, tab. iv. fig. 6–12, & tab. v. fig. 3.

"*Körper* von bläulicher Färbung, cylindrisch, gegen das Vorderende leicht verschmälert und stumpf conisch geendet, das Hinterende wenig verjüngt, stumpf; beim Weibchen gegen den Bauch eingekrümmt, beim Männchen stärker eingerollt. Die Gestalt des Schwanzes bei beiden Geschlechtern gleich. An ihm findet sich terminal eine zeimlich grosse runde Oeffnung für die Schwanzdrüse. Kurz vor der Mündung liegen noch drei kleine hornige zahnartige Klappen. Die Drüse besteht aus einem grösseren, von einer gemeinsamen Membran eingeschlossenen Zellenaggregat . . . . . .

"Am unteren Ende des Pharynx liegen auf diesem zwei schönblaue nierenförmige Augen.

"Länge des Weibchens 6 Mm., Breite 0·2 Mm.

"Länge des Männchens 4 Mm., Breite 0·2 Mm.

"Oesophaguslänge verhält sich zur Körperlänge wie 1 : 5."

This also cannot belong to the genus *Enoplus*. The first glance at Eberth's figures reveals a large pharyngeal cavity with no teeth or jaws, a distinct œsophageal ring, and an absence of the characteristic supplementary male organ, which at once negative its really belonging to this genus. It seems to be a most remarkable and interesting type, but one with which I am quite unfamiliar.

18. E. QUADIDENTATUS, Berlin.

Müller's Archiv, 1853, p. 431.—Eberth, Untersuch. über Nemat. p. 31.

Under this name Berlin appears to have included two or three forms which are perfectly distinct from one another. From his drawings, one of these animals is undoubtedly an *Enoplus*, whilst another appears to be a *Leptosomatum*.

19. E. ——, n. sp., M. Schultze.

V. Carus, Icones Zootomicæ, pl. vii. fig. 3.

No description.

This animal is evidently not an *Enoplus*.

21. LINHOMŒUS [1], Bastian.

GEN. CHAR. *Body* linear, cylindrical, scarcely tapering at all at the extremities, which are blunt and rounded. *Caudal sucker* small, very slightly prominent; sucker-tubes two, short and broad. *Integument* plain or with longitudinal markings; lateral cervical mark circular, small, with a dot in the centre; setæ more or less abundant in anterior part of body; no cephalic papillæ. *Pharyngeal cavity* of moderate size, cup-shaped, naked. *Œsophagus* distinctly muscular, swollen slightly behind pharynx and again at termination. *Intestinal cells* containing rather light-coloured particles more or less tessellate. *Vulva* about the middle of body, with minute eminences (suckers?) in median line in front and behind it. *Uterus* bifid, segments symmetrical. *Spicules* curved, pointed. *Accessory pieces* two, thin and reflexed. *Ocelli* none. *Glandular system* parietal, not much developed; floating cells in general cavity of body large; anal glands well developed. *Excretory ventral gland* consisting of a broad duct opening near middle of œsophagus, and a terminal dilated portion pressing upon first part of intestine. *Lateral canals* indistinct.

Movements rather slow.

1. L. HIRSUTUS, n. sp. (Plate XII. figs. 178, 179.)

Female, length $\frac{1}{6}''$, breadth $\frac{1}{303}''$.

External Characters.—Body tapering scarcely at all at extremities, but rather more

[1] λίνον, *a line*, and ὅμοιος, *like*, in allusion to the thread-like nature of the body.

posteriorly than anteriorly. Head truncated or obtusely rounded, surrounded by setæ, some directed forwards and others spreading, the latter continuing for some distance over anterior part of body. Integument very thin; no markings visible.

Pharyngeal cavity cup-shaped, $\frac{1}{2000}''$ deep. *Œsophagus* $\frac{1}{11}$th of total length. *Intestine* well covered with cells presenting a tessellate arrangement, and containing light-coloured granules. *Vulva* slightly anterior to middle of body; seven minute suctorial eminences in median line before and behind it, about $\frac{1}{1000}''$ apart. *Anal glands* consisting of four distinct masses. *Excretory duct* opening near middle of œsophagus. *Lateral canals* faintly granular, occupying about $\frac{1}{6}$th of circumference of body.

Male, not seen.

Hab. In sand at roots of sea-weed from tide-pools, Falmouth.

2. L. ELONGATUS, n. sp. (Plate XII. figs. 180, 181.)

Male, length $\frac{3}{10}''$, breadth $\frac{1}{533}''$.

External Characters.—Body very long and filiform, not tapering at all anteriorly, and but very slightly immediately before termination. Head bluntly rounded, furnished with a circle of eight setæ, directed forwards. Integument thin, presenting longitudinal markings $\frac{1}{12000}''$ apart.

Pharyngeal cavity nearly rectangular, depth $\frac{1}{1500}''$, having three thin horny laminæ continued backwards (into substance of œsophagus), with rounded and minutely serrated edges. *Œsophagus* about $\frac{1}{6}$th of total length. *Intestine* covered with cells having a tessellate arrangement; individual cells containing rather few granules. *Anus* $\frac{1}{55}''$ from posterior extremity. *Spicules* of moderate length, curved; *accessory pieces* thin, flat, blade-like. *Anal glands* four large, somewhat quadrate, granular bodies, lying between anal cleft and sucker-tubes. *Excretory duct* opening near middle of œsophagus.

Female, not seen.

Hab. With *Symplocostoma tenuicollis* and *Chromadora vulgaris* on fine filamentous green weed from tide-pools, Falmouth.

22. TACHYHODITES[1], Bastian.

GEN. CHAR. *Body* tapering at extremities. *Caudal sucker* very small; no sucker-tubes visible. *Integument* having transverse striæ; cephalic setæ present; papillæ absent. *Pharyngeal cavity* very small, indistinct. *Œsophagus* almost cylindrical. *Intestine* rather sparingly covered with light olive-coloured hepatic granules. *Vulva* posterior to centre of body. *Uterus* unsymmetrical. *Spicules* rather narrow, curved. *Accessory pieces* nearly straight, pointed, and directed backwards. *Ocelli* (?) two bright colourless bodies on upper surface of œsophagus. *Excretory ventral gland* . . . . . *Lateral canals* . . . . . .

Movements very rapid.

1. T. NATANS, n. sp. (Plate XIII. figs. 182–184.)

Female, length $\frac{1}{33}''$, breadth $\frac{1}{666}''$.

External Characters.—Body tapering towards either extremity, but principally towards

[1] ταχὺς, *swift*, and ὁδίτης, *a traveller*.

the posterior, which is sharp and filiform. Head bluntly rounded, furnished with a circlet of 4–6 short setæ. Integument having very fine transverse striæ, about $\frac{1}{30000}''$ apart.

Pharyngeal cavity very small, conical. *Œsophagus* about $\frac{1}{6}$th of total length, enlarging very slightly backwards. *Intestine* sparingly covered with non-tessellate hepatic granules. *Anus* $\frac{1}{200}''$ from posterior extremity. *Ocelli* two highly refractive yellowish bodies, with a dark central spot on dorsal aspect at $\frac{1}{2000}''$ from anterior extremity. *Vulva* behind centre of body.

Male, length $\frac{1}{41}''$, breadth $\frac{1}{909}''$.

Œsophagus relatively shorter. *Anus* $\frac{1}{252}''$ from posterior extremity. *Spicules* barbed at upper extremity, curved, $\frac{1}{1000}''$ long; *accessory pieces* lying nearly at right angles to spicules, pointed.

Hab. Small green filamentous weed from tide-pools, Falmouth. Also observed in a small aquarium for two or three weeks, feeding on minute vegetable spores near the surface of water.

2. T. PARVUS, n. sp. (Plate XIII. figs. 185, 186.)

Female, length $\frac{1}{45}''$, breadth $\frac{1}{1250}''$.

External Characters.—Body tapering at both extremities, especially at posterior, commencing behind vulva. Head truncate, naked. Striæ of integument imperceptible.

Pharyngeal cavity indistinct. *Œsophagus* about $\frac{1}{7}$th of total length. *Intestine* sparingly covered with hepatic particles. *Anus* $\frac{1}{345}''$ from posterior extremity. *Vulva* posterior to middle of body. *Ocelli* . . . . . .

Male, not seen.

Hab. Small green weed from tide-pools, Falmouth.

23. THERISTUS[1], Bastian.

GEN. CHAR. Body tapering at extremities. *Caudal sucker* small; sucker-tubes not visible. *Integument* having transverse striæ; lateral, circular, convex prominences close to anterior extremity; cephalic setæ, but no papillæ. *Pharyngeal cavity* moderately large, rounded; parietes membranous, not horny. *Œsophagus* distinctly muscular, nearly cylindrical. *Intestine* plentifully covered with hepatic particles, more or less tessellate, and of a brownish colour. *Vulva* at commencement of posterior third of body. *Uterus* unsymmetrical. *Spicules* shaped like a reaper's hook. *Accessory pieces* two thin rounded plates directed backwards. *Ocelli* none. *Vaginal glands* two, unequal, pyriform. *Excretory ventral gland* . . . . *Lateral canals* . . . . Movements very active.

1. T. ACER, n. sp. (Plate XIII. figs. 187–188.)

Male, length $\frac{1}{15}''$, breadth $\frac{1}{434}''$.

External Characters.—Body tapering at extremities, slightly forwards, but gradually narrowing to a point posteriorly. Head rounded, furnished with about eight spreading setæ, arising from swollen bases. Integument having transverse striæ, $\frac{1}{12000}''$ apart; conical projections $\frac{1}{3333}''$ in diameter, at $\frac{1}{1250}''$ from anterior extremity.

[1] *θεριστὴς, a reaper,* on account of the shape of the spicules.

Pharyngeal cavity rounded. *Œsophagus* between $\frac{1}{5}$th and $\frac{1}{6}$th of total length. *Intestine* abundantly covered with fat-particles having no distinct tessellate arrangement. *Anus* $\frac{1}{143}''$ from posterior extremity. *Spicules* $\frac{1}{666}''$ from point to point; *accessory pieces* curved backwards, and pyriform in shape.

Female, not seen.

Hab. Marine surface mud from estuary, Falmouth.

2. T. VELOX, n. sp. (Plate XIII. figs. 189–191.)

Female, length $\frac{1}{18}''$, breadth $\frac{1}{454}''$.

External Characters.—Body tapering slightly forwards, but rather abruptly behind vulva, and thence gradually to pointed posterior extremity. Head rounded, provided with 4–6 setæ, which are rather long, and directed forwards. Transverse striæ well marked, $\frac{1}{12000}''$ apart; convex lateral prominences of integument $\frac{1}{5000}''$ in diameter, at $\frac{1}{1000}''$ from anterior extremity.

Pharyngeal cavity rounded, $\frac{1}{2500}''$ deep. *Œsophagus* about $\frac{1}{5}$th of total length, nearly cylindrical. *Intestine* moderately well covered with olive-brown fat-particles, having a tessellate arrangement. *Anus* $\frac{1}{160}''$ from posterior extremity. *Vulva* at commencement of posterior third of body. *Vaginal glands* pyriform granular bodies, unequal, the posterior being much the larger and $\frac{1}{1250}''$ long.

Male, not seen.

Hab. About roots of small green sea-weed from tide-pools, Falmouth.

24. SPHÆROLAIMUS[1], Bastian.

GEN. CHAR. *Body* tapering at extremities. *Caudal sucker* minute; sucker-tubes not visible. *Integument* having transverse and longitudinal markings; setæ abundant; cephalic papillæ absent. *Pharyngeal cavity* large and somewhat spherical, having peculiar sets of parietal linear markings. *Œsophagus* distinctly muscular, canal defined by three rather bright bands. *Intestine* rather densely covered with dark-coloured hepatic particles. *Vulva* considerably posterior to middle of body. *Uterus* unsymmetrical. *Spicules* long and narrow. *Accessory piece* single, posterior, somewhat shield-shaped. *Ocelli* none. *Vaginal gland* single, pyriform, posterior. *Excretory ventral gland* tubular, opening near middle of œsophagus. *Lateral canals* . . . .

Movements rapid, powerful.

S. HIRSUTUS, n. sp. (Plate XIII. figs. 192–194.)

Female, length $\frac{1}{10}''$, breadth $\frac{1}{133}''$.

External Characters.—Body thick in proportion to length, tapering slightly anteriorly, but more considerably towards posterior extremity, which is slightly swollen and rounded at termination; covered with rather long setæ, which are largest and most numerous about anterior extremity. Head rounded, somewhat conical. *Integument* having transverse striæ $\frac{1}{15000}''$ apart, and an appearance of longitudinal also, $\frac{1}{10000}''$ apart.

[1] σφαῖρα, *a globe*, and λαιμος, *the throat*.

Pharyngeal cavity somewhat globular, about $\frac{1}{400}''$ in depth, surrounded about middle by a dark band, apparently due to markings of its walls, whilst anteriorly more delicate lines are seen converging towards the mouth. *Œsophagus* about $\frac{1}{3}$rd of total length. *Intestine* densely covered with fat-particles of a dark colour, obscurely tessellate. *Anus* $\frac{1}{87}''$ from posterior extremity. *Vulva* considerably posterior to middle of body, $\frac{1}{100}''$ in front of anal cleft. *Vaginal gland* single, brownish, pyriform, projecting backwards, $\frac{1}{333}''$ long, by $\frac{1}{500}''$ wide. *Excretory ventral gland* tubular, not dilated at extremity, extending from posterior part to a little in front of middle of œsophagus, where its duct opens.

Male, length $\frac{1}{10}''$, breadth $\frac{1}{154}''$ *Œsophagus* shorter than in female. *Anus* $\frac{1}{91}''$ from posterior extremity. *Spicules* long, rather narrow, and moderately curved, $\frac{1}{115}''$ in length; *accessory piece* single, shield-shaped, with two grooves, along which the spicules glide, $\frac{1}{1000}''$ long, by $\frac{1}{1250}''$ broad.

Hab. Marine surface-mud from estuary, Falmouth.

25. COMESOMA[1], Bastian.

Gen. Char. *Body* tapering at extremities. *Caudal sucker* moderately distinct; sucker-tubes none (?). *Integument* having transverse and longitudinal striæ, spiral lateral cervical markings, setæ more or less abundant about anterior and posterior extremities, papillæ none. *Pharyngeal cavity* small, cup-shaped. *Œsophagus* muscular, more or less swollen posteriorly. *Intestine* moderately well covered with hepatic particles, mostly having a tessellate arrangement. *Vulva* about the middle of body. *Uterus* bifid; segments symmetrical. *Spicules* very long and narrow. *Accessory pieces* none, or, if present, single, small, and indistinct. *Ocelli* none. *Anal glands* (?). *Excretory ventral gland* consisting of a slightly dilated posterior portion and a wide duct extending from commencement of intestine to about middle of œsophagus. *Lateral canals* having a faintly granular appearance.

Movements moderately rapid, frequently forming body into a circular coil.

1. Comesoma vulgaris, n. sp. (Plate XIII. figs. 195–197.)

Female, length $\frac{1}{7}''$, breadth $\frac{1}{222}''$.

External Characters.—Body opaque white, tapering slightly towards head, but more considerably towards posterior extremity, which is long and narrow, but slightly swollen at termination. Head rounded, provided with two circlets of setæ, the anterior (four) being very long, but those forming the posterior, from six to eight in number, being much shorter. Other setæ scattered over anterior part of body. Integument with longitudinal markings $\frac{1}{7500}''$ apart, and more delicate transverse striæ $\frac{1}{15000}''$ apart; lateral spiral marking at same level as second circlet of setæ.

Pharyngeal cavity small, cup-shaped. *Œsophagus* $\frac{1}{11}$th of total length. *Intestine* covered with light-coloured hepatic particles, having a tessellate arrangement. *Anus* $\frac{1}{71}''$ from posterior extremity. *Vulva* at middle of body. *Excretory duct* opening opposite middle of œsophagus.

Male, same size as female. Posterior extremity having setæ scattered over its surface,

[1] κόμη, *hair*, and σῶμα, *body*.

especially in ventral region before and behind anus, where there is a linear series. *Anus* $\frac{1}{77}''$ from posterior extremity. *Spicules* very long and narrow, but slightly rounded and enlarged at points, length $\frac{1}{128}''$; *accessory piece* none.

Hab. Small green sea-weeds from tide-pools, Falmouth.

2. C. PROFUNDI, n. sp. (Plate XIII. figs. 198–200.)

Female, length $\frac{1}{9}''$, breadth $\frac{1}{250}''$.

External Characters.—Body light-coloured, slender, tapering gradually forwards, but more notably towards posterior extremity, which is rather long and filiform, having two small setæ at its termination. Head truncate, furnished with a circlet of six stout and long, spreading setæ. Integument having longitudinal markings, transverse not visible; two circular(?) depressions, one on each side of head, and about $\frac{1}{3333}''$ in diameter.

Pharyngeal cavity very small, almost wanting. *Œsophagus* about $\frac{1}{9}$th of total length, gradually widening towards termination. *Intestine* covered with pale-coloured hepatic particles, having a tessellate arrangement. *Anus* $\frac{1}{100}''$ from posterior extremity. *Vulva* about the middle of body. *Uterine segments* rather short. *Excretory duct* opening opposite middle of œsophagus.

Male, length $\frac{1}{9}''$, breadth $\frac{1}{333}''$.

Anus $\frac{1}{100}''$ from posterior extremity. *Spicules* very long, slightly curved, length $\frac{1}{143}''$, apparently not tubular, but grooved from angular bending. *Accessory piece* small, indistinct.

Hab. In mud dredged up from a depth of 20 fathoms, Falmouth Harbour.

26. SPIRA[1], Bastian.

GEN. CHAR. *Body* tapering at extremities. *Caudal sucker* very small and indistinct; sucker-tubes absent. *Integument* having transverse striæ; two small, lateral, circular, convex prominences or depressions of integument in cervical region; setæ not abundant, principally cephalic; cephalic papillæ wanting. *Pharyngeal cavity* wanting. *Œsophagus* short, distinctly muscular, with a simple terminal swelling. *Intestine* moderately well covered with rather large, light-coloured hepatic particles. *Vulva* at middle of body. *Uterus* bifid; segments symmetrical. *Spicules* curved, moderately broad, enlarged at upper extremities. *Accessory pieces* two, nearly straight. *Ocelli* none. *Excretory ventral gland* . . . . *Lateral canals* . . . .

Movements active.

1. S. PARASITIFERA, n. sp. (Plate XIII. figs. 201–203.)

Female, length $\frac{1}{10}''$, breadth $\frac{1}{333}''$.

External Characters.—Body opaque white, tapering anteriorly and also gradually to a point posteriorly. Head rounded, provided with a circlet of 4–6 short setæ. Integument with faint transverse striæ $\frac{1}{20000}''$ apart; small lateral hemispherical prominences close to anterior extremity.

Œsophagus about $\frac{1}{17}$th of total length; terminal swelling nearly globular. *Intestine*

[1] σπείρα, *a coil*, from the frequency with which they twist their bodies into this form.

rather narrow, moderately well covered with rather large particles having a tessellate arrangement. *Anus* $\frac{1}{200}''$ from posterior extremity. *Vulva* near middle of body.

Male, about same size as female. *Anus* about $\frac{1}{200}''$ from posterior extremity. *Spicules* rather short, curved, $\frac{1}{455}''$ in length; *accessory pieces* short, horizontal; proximal extremity curved and pointed.

Hab. Amongst sand and small stones from tide-pools, Falmouth.

Body often more or less covered with minute tufts of hair-like algæ, whilst to the posterior extremities of two specimens I have seen groups of *Vorticella* attached.

2. S. LÆVIS, n. sp. (Plate XIII. figs. 204–206.)

Female, length $\frac{1}{6}''$, breadth $\frac{1}{200}''$.

External Characters.—Body light-coloured, tapering slightly anteriorly, and gradually narrowing to a point posteriorly. Head most distinctly rounded. Integument smooth; no striæ visible; a few small setæ scattered over anterior extremity; lateral cervical depressions (slightly raised in centre) $\frac{1}{3333}''$ in diameter, close to anterior extremity.

Œsophagus between $\frac{1}{18}$th and $\frac{1}{19}$th of total length; terminal swelling nearly globular. *Intestine* sparingly covered with light-coloured hepatic particles having a somewhat tessellate arrangement. *Anus* $\frac{1}{166}''$ from posterior extremity. *Vulva* anterior to middle of body, $\frac{1}{15}''$ from anterior extremity. *Uterus* bifid; segments symmetrical. *Ova* large, occupying whole breadth of body. *Genital tube* containing large, spherical, finely granular cells, about $\frac{1}{1000}''$ in diameter.

Male, length $\frac{1}{7}''$, breadth $\frac{1}{285}''$.

Œsophagus about $\frac{1}{20}$th of total length. *Anus* $\frac{1}{181}''$ from posterior extremity. *Spicules* large, curved, $\frac{1}{333}''$ in length; *accessory pieces* straight, rather narrow, and half the length of spicules.

Hab. In sand from roots of small algæ, tide-pools, Falmouth.

3. S. TENUICAUDATA, n. sp. (Plate XIII. figs. 207–209.)

Female, length $\frac{1}{10}''$, breadth $\frac{1}{285}''$.

External Characters.—Body white, tapering gradually anteriorly, but more abruptly towards posterior extremity, which is long and filiform. Head truncate, provided with a circle of 4–6 setæ. Integument with transverse striæ, pretty well marked, $\frac{1}{20000}''$ apart; two lateral circular depressions close to anterior extremity, $\frac{1}{3333}''$ in diameter; when looked down upon, a small central circle is seen $\frac{3}{5}$rds less in diameter than that which contains it.

Œsophagus about $\frac{1}{9}$th of total length; posterior enlargement not nearly globular. *Intestine* covered pretty uniformly with pale small-sized granules. *Anus* $\frac{1}{133}''$ from posterior extremity. *Vulva* about middle of body.

Male, length $\frac{1}{12}''$, breadth $\frac{1}{335}''$; having a few short setæ scattered over posterior extremity. *Anus* $\frac{1}{154}''$ from posterior extremity. *Spicules* narrow, curved, $\frac{1}{500}''$ long; *accessory pieces* reflexed, curved, almost linear, $\frac{1}{668}''$ long.

Hab. In sand from tide-pools, Falmouth.

The different shape and length of the œsophagus, as well as the difference in form of the spicules and accessory pieces, lead me to suspect that this species will hereafter re-

quire to be transferred to a distinct though nearly allied genus. Its present position may be looked upon merely as provisional.

27. ODONTOBIUS, Roussel.

Gen. Char. "*Body* thread-like; anterior extremity more or less narrowed; posterior obtusely or sharply pointed, ending in a small papilla. Around the mouth and on anterior part of body are several cirri. On the hinder part of the body of the male, around the genital opening, are one or two rows of roundish integumental prominences.

"*Skin* colourless or of a yellowish-green colour, occasionally iridescent. External integument smooth or transversely striped. Œsophagus cylindrical, widening slightly posteriorly; external layer or sheath composed of a finely granular mass, or cylindrical cells.

"*Vagina* variable in position. Lateral lines present. Gland (ventral?) of anterior part of body doubtful. Tail-glands consisting of an agglomeration of cells.

"Two spicules, with an anterior accessory organ[1], or two pairs of spicules, one large and one small."—*Eberth*, Unters. über Nemat. p. 27.

This description is the one given by Eberth, which I have inserted rather than that of Roussel, from its containing more details, though even these are insufficient accurately to characterize and fix the position of the genus. Eberth naturally enough objects to Diesing's having in his recent "Revision der Nematoden" placed this genus amongst his subfamily *Anguillulidæ*, since Roussel's *Odontobius* was distinctly stated to be provided with cirri around the mouth. Eberth is, however, himself uncertain what systematic place to assign to this genus, but says that he includes in it several free Nematoids which, from the appearance of small teeth[2] in the mouth, are distinguished from those of *Amblyura*, *Phanoglene*, *Enchelidium*, and *Oncholaimus*, and, through the want of ocelli, from those of *Enoplus*.

Whether the original animal described by Roussel de Vauzème, and found by him in or on the mucous membrane about the base of the whalebone in *Balæna Australis*, is rightly included amongst the free Nematodes is a point about which I am still doubtful; but, as it seems quite possible that one of these animals might be met with in such a situation, I have retained it amongst them, and have refrained from altering the designation of three of the species placed by Eberth in this genus, though one of them seems to differ in some important respects from the other two.

1. O. ceti, Roussel.

Odontobius Ceti, Roussel de Vauzème, in Annal. des Sc. Nat. 2 sér. i. 326, tab. ix. 1–5 A; et Froriep's Notiz. xxxvii. 1, figs. 3–6; Isis, 1836, p. 512.—Siebold, in Wiegmann's Archiv, 1835, i. 336.—Nordmann, in Lamarck's Anim. sans Vert. 2de édit. iii. 669.—Dujardin, Hist. Nat. des Helminthes, 292.

"*Corpus* capillare, extremitate caudali involuta. *Caput* corpore continuum. *Os* terminale, orbiculare, dentibus corneis 3–6. *Penis* . . . .; apertura genitalis feminea . . . . . Longit. ad $2\frac{1}{2}'''$.

[1] This seems only to have been met with in *Odontobius acuminatus*, which I have transferred to the genus *Anticoma*, so that the latter part of this sentence only must now be considered as applicable to the genus *Odontobius*.

[2] He omits to mention these in his generic description given above.

"*Hab. Balæna australis*, in strato mucoso clasmatis cum ovulis suis gregarie nidulans; ad insulas Malorinas, Octobri usque ad Januarium."—*Diesing*, Syst. Helm. vol. ii. p. 123.

2. O. MICANS, Eberth.

Unters. über Nemat. p. 28, tab. i. figs. 1–5.

"*Körper* des Weibchens fadenförmig, Kopf wenig verschmälert, quer abgestutzt, von einem Haarkranze umgeben, vom übrigen Körper durch eine seichte Einschnürung getrennt. Schwanz gegen den Bauch eingekrümmt, in eine kurze Spitze endigend. Hinterende des Männchens stärker eingebogen.

"Weibchen 1·5 Mm. lang, 0·15 Mm. breit.

"Männchen 1·25 Mm. lang, 0·13 Mm. breit.

"Oesophagus=ein Viertel der Körperlänge."

3. O. FILIFORMIS, Eberth.

Unters. über Nemat. p. 29, tab. i. figs. 10–12.

"*Körper* des Männchens fadenförmig, von leicht gelblicher Färbung, schon vom Oesophagus an ziemlich stark einwärts gerollt. *Kopf* fast quer abgestutzt, hinter dem Pharynx leicht eingeschnürt. In der Gegend des letzteren etwas weiter nach hinten ist die Haut mit feinen kurzen Härchen besetzt, welche in Querreihen angeordnet scheinen. Das Schwanzende des Männchens wenig verjüngt und stumpf geendigt.

"*Länge* des Männchens 7 Mm., Breite 0·08 Mm.

"Oesophagus=ein Sechstel der Körperlänge."

4. O. STRIATUS, Eberth.

Unters. über Nemat. p. 30, tab. i. figs. 21–27.

"*Körper* bei beiden Geschlechtern ziemlich gleich, fadenförmig, gegen den Bauch eingekrümmt, in der Mitte stärker anschwellend, an beiden Enden verschmälert. Vorderende fast quer abgestutzt, um die Mundöffnung und hinter dieser mit kurzen Härchen besetzt. Schwanzende abgerundet, mit einer spitzen durchborten Papille versehen.

"*Länge* des Weibchens 3 Mm., Breite 0·175 Mm.

"Länge des Männchens 2 Mm., Breite 0·1 Mm.

"Oesophaguslänge $\frac{3}{4}$ Mm."

28. CYATHOLAIMUS[1], Bastian.

GEN. CHAR. *Body* mostly of a brownish colour, tapering at extremities; posterior conical. *Caudal sucker* mostly well marked, cylindrical; sucker-tubes occasionally present. *Integument* having transverse striæ or rows of dots; small, lateral, circular, convex prominences in cervical region, and occasionally others over posterior part of body; cephalic setæ generally present, papillæ occasionally. *Pharyngeal cavity* cup-shaped, with slight longitudinal rib-like markings. *Œsophagus* nearly uniform and cylindrical; central canal broad. *Intestine* moderately well covered with large and

[1] κύαθος *a cup*, and λαιμὸς, *the throat*, in allusion to the shape of the pharyngeal cavity.

generally dark fawn-coloured hepatic particles. *Vulva* about the middle of body. *Uterus* bifid; segments symmetrical. *Spicules* rather thick and solid, of a yellowish colour. *Accessory pieces* four, in two pairs, the longer being somewhat lamelliform, whilst the external pair are thick and quadrilateral. *Ocelli*, two aggregations of brownish pigment on dorsum of œsophagus; not present in some species. *Glandular system* well developed; subcutaneous, glandular, cell-like bodies numerous; anal glands three, occasional. *Excretory ventral gland* terminating in moderate-sized duct, opening opposite middle of œsophagus. *Lateral canals* . . . .

Movements moderately active.

* *Caudal sucker well marked, cylindrical.*

1. C. OCELLATUS, n. sp. (Plate XIII. figs. 210–212*a*.)

Female, length $\frac{1}{17}''$, breadth $\frac{1}{460}''$.

External Characters.—Body tapering slightly forwards, but much more towards posterior extremity. Head rounded, provided with a circlet of four small setæ. Integument with delicate transverse striæ, faintly visible, $\frac{1}{20000}''$ apart; shreds easily peeling off under pressure.

Pharyngeal cavity $\frac{1}{2500}''$ deep. *Œsophagus* rather less than $\frac{1}{7}$th of total length. *Intestine* thinly covered with fat-particles, non-tessellated. *Anus* $\frac{1}{215}''$ from posterior extremity. *Vulva* slightly anterior to middle of body. *Ocelli*, two small greenish-brown masses of pigment, $\frac{1}{900}''$ from anterior extremity. *Subcutaneous gland-cells* numerous, rounded, granular, giving the animal a peculiar maculated appearance.

Male, length $\frac{1}{22}''$ breadth $\frac{1}{535}''$.

Anus $\frac{1}{328}''$ from posterior extremity. *Spicules* curved, somewhat wedge-shaped, $\frac{1}{500}''$ long; *accessory pieces* four; principal pair rather long, narrow, and united in middle line; external pair rounded.

Hab. About *Cladophora rupestris* from tide-pools, Falmouth.

2. C. CÆCUS, n. sp. (Plate XIII. figs. 213, 214.)

Female, length $\frac{1}{15}''$, breadth $\frac{1}{333}''$.

External Characters.—Body tapering slightly forwards, but gradually narrowing to a point posteriorly. Head broad, truncate, having a circlet of four small setæ. Integument with almost imperceptible transverse striæ, about $\frac{1}{30000}''$ apart.

Pharyngeal cavity cup-shaped. *Œsophagus* about $\frac{1}{7}$th of total length. *Intestine* sparsely covered with large, coloured hepatic particles. *Anus* $\frac{1}{238}''$ from posterior extremity. *Vulva* anterior to middle of body. *Ocelli* wanting. *Subcutaneous gland-cells* round or oval, granular, about $\frac{1}{2000}''$ in diameter.

Male, not seen.

Hab. Marine surface-mud from estuary, Falmouth.

3. C. ORNATUS, n. sp. (Plate XIII. figs. 215, 216.)

Female, length $\frac{1}{27}''$, breadth $\frac{1}{357}''$.

External Characters.—Body stout, light fawn-coloured, tapering slightly forwards, but gradually to a point posteriorly, where it terminates in an elongated sucker; sucker-

tubes two, short, distinct. Head truncate, provided with 8–10 short setæ directed forwards. Integument with transverse striæ scarcely perceptible, $\frac{1}{20000}''$ apart.

Pharyngeal cavity cup-shaped, $\frac{1}{2000}''$ deep. *Œsophagus* rather less than $\frac{1}{4}$th of total length. *Intestine* well covered with brownish fat-particles having a tessellate arrangement. *Anus* $\frac{1}{250}''$ from posterior extremity. *Vulva* slightly posterior to middle of body. *Ocelli*, two aggregations of brown pigment, at $\frac{1}{1000}''$ from anterior extremity. *Subcutaneous gland-cells* abundant. *Anal glands* three, large. *Excretory ventral gland* opening opposite middle of œsophagus; duct rather narrow, uniform in size.

Male, not seen.

Hab. Small green sea-weed from tide-pool, Falmouth[1].

** *Caudal sucker small, indistinct.*

4. C. PUNCTATUS, n. sp. (Plate XIII. figs. 217, 218.)

Male, length $\frac{1}{12}''$, breadth $\frac{1}{263}''$.

External Characters.—Body powerful, tapering very slightly anteriorly, but gradually to a point posteriorly. Head obtusely rounded, provided with a circlet of 6–8 small spreading setæ; other small setæ scattered over posterior part of body. Integument having rows of dots arranged in transverse series $\frac{1}{15000}''$ apart; two lateral convex prominences of integument in cervical region nearly opposite base of pharyngeal cavity, $\frac{1}{3333}''$ in diameter.

Pharyngeal cavity cup-shaped. *Œsophagus* about $\frac{1}{10}$th of total length. *Intestine* sparsely and irregularly covered with large brownish-coloured fat-particles. *Anus* $\frac{1}{117}''$ from posterior extremity. *Spicules* $\frac{1}{333}''$ long. *Ocelli* two, greenish brown, large, $\frac{1}{1428}''$ from anterior extremity. *Subcutaneous gland-cells* wanting.

Female, not seen.

Hab. Marine surface-mud from estuary, Falmouth.

5. C. STRIATUS, n. sp. (Plate XIII. figs. 219, 220.)

Male, length $\frac{1}{12}''$, breadth $\frac{1}{285}''$.

External Characters.—Body tapering slightly anteriorly, but gradually to a point posteriorly. Head obtusely rounded, provided with two small papillæ, upper and lower, and a circlet of about six setæ directed forwards. Integument with very distinct transverse striæ $\frac{1}{12000}''$ apart; a few scattered setæ over anterior part of body, but numerous others posteriorly behind anal cleft.

Pharyngeal cavity cup-shaped, $\frac{1}{2000}''$ deep. *Œsophagus* $\frac{1}{11}$th of total length. *Intestine* well covered with hepatic particles having a tessellate arrangement. *Anus* $\frac{1}{125}''$ from posterior extremity. *Spicules* thick, strong, slightly curved, $\frac{1}{400}''$ long: *accessory pieces* four; two median lanceolate, thin; two external stout, quadrilateral. *Ocelli* wanting. *Subcutaneous gland-cells* plentiful.

Female, not seen.

Hab. Marine surface-mud from estuary, Falmouth.

[1] Or else from marine surface-mud of estuary. I am not quite certain which, as the habitat was unfortunately not entered at the time when the species was discovered and described.

6. C. GRACILIS.

Enoplus gracilis, Eberth, Unters. über Nemat. p. 34, tab. ii. figs. 13–19.

"*Körper* in der Mitte leicht angeschwollen, Vorderende verschmälert, Kopf abgerundet, leicht vom übrigen Körper abgeschnürt. Hinterende beider Geschlechter zugespitzt und gegen den Bauch eingebogen. Der Schwanz in einen kleinen durchbohrten zierlichen Fortsatz ausgezogen . . . . . .

"Länge des Weibchens $3\frac{1}{4}$ Mm., Breite 0·15 Mm.

"Länge des Männchens 2 Mm., Breite 0·1 Mm.

"Oesophaguslänge verhält sich zur Körperlänge wie 1 : 6."

I have placed this animal in the genus *Cyatholaimus*, because it seems more nearly allied to the representatives of this type than to any others that I have met with. It is most certainly not an *Enoplus*, and will hereafter, I suspect, be found to belong to a genus distinct from, though closely allied to, the one in which I have now temporarily located it.

29. SPILIPHERA[1], Bastian.

GEN. CHAR. *Body* tapering at extremities, conical posteriorly. *Caudal sucker* elongated, cylindrical; sucker-tubes undeveloped. *Integument* having transverse rows of dots or striæ, and two longitudinal rows of dots close together in each lateral region, as well as a spiral cervical marking on each side, close to the head; cephalic setæ mostly present; no papillæ. *Pharyngeal cavity* cup-shaped, having longitudinal rays or rib-like markings and three horny apophyses spreading from its base. *Œsophagus* frequently enlarged behind pharynx, and generally terminating in an ovoid swelling. *Intestine* mostly pretty well covered with large, coloured hepatic particles. *Vulva* about middle of body. *Uterus* bifid; segments symmetrical. *Spicules* curved, narrow. *Accessory pieces* two, somewhat ovate, indistinct. *Ocelli* absent. *Anal glands* three, sometimes absent. *Excretory ventral gland* opening near middle of œsophagus. *Lateral canals* . . . . . .

Movements moderately active.

1. S. ELEGANS, n. sp. (Plate XIII. figs. 221, 222.)

Male, length $\frac{1}{17}''$, breadth $\frac{1}{250}''$.

External Characters.—Body tapering most at posterior extremity. Head bluntly rounded, provided with 2–4 minute setæ, directed forwards. Integument having transverse rows ($\frac{1}{7500}''$ apart) of minute rectangular dots, and two longitudinal rows of larger ones, $\frac{1}{5000}''$ apart, on each side of body.

Pharyngeal cavity somewhat infundibuliform, $\frac{1}{2000}''$ deep; three curved equal-sized apophyses extending backwards into substance of œsophagus, $\frac{1}{1428}''$ in length. *Œsophagus* $\frac{1}{6}$th of total length; swollen opposite apophyses, and again very distinctly at termination. *Intestine* covered irregularly with large-sized, greenish-yellow hepatic particles. *Anus* $\frac{1}{200}''$ from posterior extremity. *Spicules* narrow, slightly curved, $\frac{1}{454}''$

[1] σπῖλος, *a spot*, and φέρω, *to bear*, in reference to the integumental markings.

long; *accessory pieces* ovate, leaf-like, about $\frac{1}{3}$rd as long, rather indistinct. *Anal glands* . . . . . *Excretory ventral duct* . . . . . .

Female, not seen.

Hab. Marine surface-mud from estuary, Falmouth.

2. S. INÆQUALIS, n. sp. (Plate XIII. figs. 223–225.)

Female, length $\frac{1}{28}''$, breadth $\frac{1}{500}''$.

External Characters.—Body tapering as in last species. Head slightly rounded, provided with 2–4 spreading setæ. Integument with well-marked transverse striæ, $\frac{1}{15000}''$ apart, and two longitudinal lines of dots, about $\frac{1}{5000}''$ apart, on each side of the body.

Pharyngeal cavity cup-shaped, rather indistinct, having two apophyses extending backwards for about $\frac{1}{1066}''$, the third being small and abortive. *Œsophagus* $\frac{1}{5}$th of total length, with post-pharyngeal and terminal swellings. *Intestine* covered pretty uniformly with large olive-yellow-coloured fat-particles. *Anus* $\frac{1}{200}''$ from posterior extremity. *Vulva* slightly posterior to middle of body. *Excretory ventral duct* . . . . . .

Male, about same size or rather larger.

Anus $\frac{1}{222}''$ from posterior extremity. *Spicules* narrow, slightly curved, $\frac{1}{1000}''$ long; *accessory pieces* indistinct. In *mid-ventral region*, anterior to anal cleft, is a linear series of about fifteen small, bright, rectangular spots, equidistant and $\frac{1}{2000}''$ apart.

Hab. Marine surface-mud of estuary, Falmouth.

3. S. ROBUSTA, n. sp. (Plate XIII. figs. 226, 227.)

Female, length $\frac{1}{12}''$, breadth $\frac{1}{222}''$.

External Characters.—Body stout, of a brownish-yellow colour, scarcely tapering at all anteriorly, but very abruptly posterior to anus. Head rounded, naked. Integument with rows of dots, transverse, and $\frac{1}{12000}''$ apart.

Pharyngeal cavity large, $\frac{1}{1000}''$ deep, longitudinal ribs well marked; three very thick and nearly straight apophyses extending backwards for $\frac{1}{1000}''$. *Œsophagus* $\frac{1}{6}$th of total length, cylindrical, and nearly uniform in size. *Intestine* covered with large, yellowish granules having a tessellate arrangement. *Anus* $\frac{1}{222}''$ from posterior extremity. *Vulva* slightly anterior to middle of body. *Uterus* bifid. *Excretory ventral gland* extending from about middle of œsophagus to commencement of intestine. *Anal glands* three, large, occupying nearly the whole of space posterior to anal cleft.

Male, not seen.

Hab. Marine surface-mud of estuary, Falmouth.

The very large size of the apophyses, the uniform calibre of the œsophagus, and the apparent absence of the lateral longitudinal rows of dots are all divergences from the typical characters of this genus, whose value it is at present difficult to estimate, and more particularly so since the characters of the male are as yet unknown.

4. S. COSTATA, n. sp. (Plate XIII. figs. 228, 229.)

Male, length $\frac{1}{19}''$, breadth $\frac{1}{435}''$.

External Characters.—Body rather dark in colour anteriorly; tapering conically at posterior extremity. Sucker cylindrical, well marked. Head truncate, having a circlet

of four strong patent setæ. Integument with most marked transverse striæ, $\frac{1}{10000}''$ apart, and equidistant longitudinal ridges, very obvious in the middle portions of body, but less evident towards extremities.

Pharyngeal cavity indistinct. *Œsophagus* about $\frac{1}{7}$th of total length, with post-pharyngeal and terminal swellings. *Intestine* undistinguishable, from the total absence of the usual hepatic cells and contained fat-particles. *Anus* $\frac{1}{200}''$ from posterior extremity. *Spicules* slightly curved and rather broad, $\frac{1}{166}''$ long; *accessory pieces* not recognized.

Female, not seen.

Hab. Marine surface-mud from estuary, Falmouth.

Having only seen two specimens of this species, I am not quite certain about the exact structure of its pharynx, and the presence or absence of accessory pieces to the spicules. The almost uniform light colour of, and absence of pigment from its internal parts, combined with a somewhat opaque integument, was the cause of my failure in ascertaining these points.

30. CHROMADORA [1], Bastian.

Rhabditis, Max Schultze; *Enoplus*, Diesing.

Gen. Char. *Body* tapering at extremities; conical posteriorly. *Caudal sucker* elongated, pointed; sucker-tubes not developed. *Integument* having transverse and longitudinal striæ, frequently somewhat clouded and opaque anteriorly; cephalic setæ generally present, papillæ not. *Pharyngeal cavity* small and indistinct, with three cuneiform horny apophyses (apices downwards) extending backwards, and in contact. *Œsophagus* having a more or less distinct swelling posteriorly; muscular tissue not well developed. *Intestine* mostly covered with irregularly arranged, large-sized, coloured hepatic particles. *Vulva* at middle of body. *Uterus* bifid; segments symmetrical. *Spicules* two, somewhat narrow, curved. *Accessory pieces* well marked, about half as long as spicules. *Ocelli* two masses of reddish pigment on dorsum of anterior part of œsophagus; sometimes wanting. *Glandular system* not much developed. *Excretory ventral gland* opening by a rather small duct nearly opposite middle of œsophagus (?). *Lateral canals* . . . . . .

Movements active.

1. C. vulgaris, n. sp. (Plate XIII. figs. 233–235.)

Female, length $\frac{1}{10}''$, breadth $\frac{1}{250}''$.

External Characters.—Body clouded anteriorly, tapering from near the middle to either extremity, but somewhat widening again at head, which is truncated and provided with small setæ. Integument with very distinct transverse striæ at intervals of $\frac{1}{5000}''$, which are crossed by delicate longitudinal lines $\frac{1}{30000}''$ apart; small longitudinal ridge on either side of body [2].

[1] χρῶμα, *pigment*, and δορὰ, *skin*, on account of the frequency with which the transparency of the integument of the anterior part of the body is obscured by a dark tinge of colour.

[2] About anterior part of body the markings of integument seem almost more dotted than linear.

Pharyngeal cavity shallow and indistinct; apophyses well marked, $\frac{1}{1000}''$ long. *Œsophagus* about $\frac{1}{7}$th of total length, with a large ovoid swelling at termination, and provided with two rows of brownish pigment extending backwards on either side from two local reddish-brown aggregations $\frac{1}{666}''$ from the anterior extremity and within the sheath of œsophagus. *Intestine* covered with fat-particles, having a more or less tessellate arrangement. *Anus* $\frac{1}{100}''$ from posterior extremity. *Vulva* at middle of body. *Ocelli* as above.

Male, length $\frac{1}{13}''$, breadth $\frac{1}{285}''$.

Anus $\frac{1}{133}''$ from posterior exterior extremity. *Spicules* curved, $\frac{1}{333}''$ long; *accessory pieces* two, strong, broad, $\frac{1}{588}''$ long.

Hab. Very abundant about *Cladophora rupestris* and some other small green weeds from tide-pools, Falmouth.

2. C. NUDICAPITATA, n. sp. (Plate XIII. figs. 230–232.)

Female, length $\frac{1}{33}''$, breadth $\frac{1}{666}''$.

External Characters.—Body tapering very slightly forwards. Head rounded, naked. Integument with delicate transverse striæ, $\frac{1}{15000}''$ apart; longitudinal not recognized.

Pharyngeal cavity shallow and indistinct; apophyses $\frac{1}{2500}''$ long. *Œsophagus* about $\frac{1}{7}$th of total length; rounded swelling at termination. *Intestine* sparingly covered with hepatic particles. *Anus* $\frac{1}{220}''$ from posterior extremity. *Vulva* slightly anterior to middle of body. *Ocelli* two, reddish brown, at $\frac{1}{1000}''$ from anterior extremity; occasionally one only, in middle line.

Male, length $\frac{1}{33}''$, breadth $\frac{1}{835}''$.

Anus $\frac{1}{330}''$ from posterior extremity. *Spicules* slightly curved, $\frac{1}{833}''$ long; *accessory pieces* narrow, and curved at inner extremities, about $\frac{1}{1200}''$ long. In *mid-ventral* region above anus, within the substance of the integument, are five disk-shaped, highly refractive bodies, about $\frac{1}{5000}''$ in diameter, whose distances apart gradually diminish anteriorly.

Hab. On small, stunted, greyish specimens of *Cladophora rupestris* from tide-pools near high-water mark, Falmouth.

3. C. NATANS, n. sp. (Plate XIII. figs 236–238.)

Female, length $\frac{1}{22}''$, breadth $\frac{1}{500}''$.

External Characters.—Body tapering very slightly towards anterior extremity, but as usual at posterior. Head rounded, provided with four spreading setæ. Integument very transparent, not darkened anteriorly, having transverse striæ $\frac{1}{12000}''$ apart; longitudinal not recognized.

Pharyngeal cavity indistinct; apophyses $\frac{1}{1666}''$ in length. *Œsophagus* $\frac{1}{7}$th of total length. *Intestine* well covered with large-sized greenish-yellow granules, having no distinct arrangement. *Anus* $\frac{1}{182}''$ from posterior extremity. *Vulva* at middle of body. *Ocelli* two distinct conical aggregations of red pigment, situated almost laterally on the œsophagus, which is somewhat narrower at this point.

Male, length $\frac{1}{23}''$, breadth $\frac{1}{555}''$.

Anus $\frac{1}{211}''$ from posterior extremity. *Spicules* rather narrow, curved, $\frac{1}{714}''$ long;

accessory pieces $\frac{1}{909}''$ long. In *mid-ventral* region, above anus, is a linear series of five highly refractile roundish bodies, similar in kind to those of *C. nudicapitata*.

Hab. Found swimming near the surface of the water in a small aquarium containing weeds from tide-pools, Falmouth.

4. C. CÆCA, n. sp. (Plate XIII. figs. 239–241.)

Female, length $\frac{1}{30}''$, breadth $\frac{1}{500}''$.

External Characters.—Body tapering considerably at both extremities. Head truncate, provided with four setæ directed forwards. Integument having well-marked transverse striæ at $\frac{1}{20000}''$ apart, and with the appearance of longitudinal also.

Pharyngeal cavity small, indistinct; apophyses three. *Œsophagus* about $\frac{1}{7}$th of total length; posterior swelling distinct. *Intestine* sparsely and irregularly covered with fat-granules of large size. *Anus* $\frac{1}{238}''$ from posterior extremity. *Vulva* about the middle of body. *Ocelli* wanting.

Male, length $\frac{1}{37}''$, breadth $\frac{1}{500}''$.

Anus $\frac{1}{285}''$ from posterior extremity. *Spicules* slender, curved, $\frac{1}{1000}''$ long; *accessory pieces* two, nearly half as long.

Hab. Marine surface-mud from estuary, Falmouth.

5. C. FILIFORMIS, n. sp. (Plate XIII. figs. 242–244.)

Female, length $\frac{1}{30}''$, breadth $\frac{1}{666}''$.

External Characters.—Body very slender, tapering most notably towards extremities, so as to appear somewhat spindle-shaped. Head bluntly rounded, provided with 2–4 setæ. Integument with transverse striæ $\frac{1}{15000}''$ apart.

Pharyngeal cavity indistinct; length of apophyses $\frac{1}{2000}''$. *Œsophagus* about $\frac{1}{6}$th of total length; posterior swelling not very distinct. *Intestine* thinly covered with irregularly disposed hepatic particles. *Anus* $\frac{1}{222}''$ from posterior extremity. *Vulva* slightly posterior to middle of body. *Ocelli* two, reddish brown, $\frac{1}{1250}''$ from anterior extremity.

Male, longer, though more slender, than female; length $\frac{1}{22}''$, breadth $\frac{1}{1000}''$.

Anus $\frac{1}{182}''$ from posterior extremity. *Spicules* rather short, curved, $\frac{1}{1250}''$ in length. *Accessory pieces* about half as long.

Hab. Small green sea-weeds from tide-pools, Falmouth.

6. C. SABELLOIDES, n. sp. (Plate XIII. figs. 245, 246.)

Male, length $\frac{1}{31}''$, breadth $\frac{1}{666}''$.

External Characters.—Body tapering very slightly anteriorly, but in usual manner at posterior extremity. Head rounded, provided with four moderately long setæ. Integument with transverse striæ $\frac{1}{15000}''$ apart; longitudinal not recognizable.

Pharyngeal cavity indistinct; apophyses about $\frac{1}{3333}''$ in length. *Œsophagus* about $\frac{1}{5}$th of total length; posterior third forming an elongated terminal swelling. *Intestine* thinly covered with hepatic granules. *Anus* $\frac{1}{285}''$ from posterior extremity. *Spicules* slightly curved, $\frac{1}{1000}''$ long. *Accessory pieces* $\frac{1}{1666}''$ long.

Female, not seen.

Hab. Marine surface-mud, Falmouth. Found in the mud, moving about with a tube

like that of a *Sabella*, composed of the finest particles of sand and *Diatomaceæ* agglutinated together. Tube longer than worm, but embracing its body pretty closely.

7. C. PAPILLATA, n. sp. (Plate XIII. figs. 247, 248.)

Male, length $\frac{1}{15}''$, breadth $\frac{1}{333}''$.

External Characters.—Body tapering slightly anteriorly; posterior extremity rather narrower, and more elongated than usual. Head rounded, provided with two (upper and lower) horn-like papillæ in front, and four rounded ones (crucially arranged) behind them; also four setæ arising close to these posterior papillæ. Integument brittle, clouded anteriorly, having well-marked transverse striæ $\frac{1}{7000}''$ apart, and longitudinal ones at a distance of $\frac{1}{30000}''$.

Pharyngeal cavity and apophyses . . . . . *Œsophagus* $\frac{1}{6}$th of total length, slightly swollen posteriorly. *Intestine* moderately well covered with light-coloured hepatic particles. *Anus* $\frac{1}{133}''$ from posterior extremity; posterior boundary of anal cleft rather prominent, and containing a small horny body within its substance. *Spicules* curved, rather narrower at upper extremities, $\frac{1}{357}''$ long; *accessory pieces* strong, hook-like, $\frac{1}{625}''$ long. *Ocelli* wanting. *Excretory ventral duct* rather narrow; opening opposite middle of œsophagus.

Female, not seen.

Hab. Marine surface-mud from estuary, Falmouth.

The nature of the head and pharynx in this species differs somewhat from the strict type of this genus, though, in other important points, the characters are identical.

8. C. BIOCULATA.

Rhabditis bioculata, M. Schultze.—V. Carus's Icones Zootom. tab. viii. 2.
Enoplus bidentatus, Diesing, Sitzungs. der Kais. Akad. der Wissen. xlii. Band (1860), p. 625.

No description.

9. C. OCELLATA.

Urolabes ocellata, Carter, Ann. of Nat. Hist. ser. 3. vol. iv. p. 43.
Phanoglene ocellata, Eberth, Unters. über Nemat. p. 21, pl. iii. fig. 31.

"*Female*, linear, cylindrical, unstriated[1], ocellated, diminishing gradually towards the head, which is obtuse and provided with four short, linear cirri; also diminishing gradually towards the tail, which is short, somewhat curved, and furnished with a pointed digital termination. Mouth, vulva[2], and anus situated as in the foregoing species.

"Alimentary canal the same, but with the œsophageal sheaths more bulbous posteriorly, and no globular dilatation of the intestinal sheath posterior to it."

"*Size.* About $\frac{1}{32}$nd of an inch long."

"*Male*, the same as the female, with the exception of the difference in the generative organs."

"*Hab.* Silty clots of *Oscillatoria* floating in the salt-water main drain of the town of Bombay."

[1] Perhaps striæ fine, and not recognized.

[2] In middle of body.

GENERA IMPERFECTLY DESCRIBED.

31. AMBLYURA, Hemprich and Ehrenberg.

Enchelis, Hill; *Vibrio*, Müller; *Enoplus*?, Dujardin; *Anguillula*, Leidy.

Gen. Char. "*Corpus* capillare, extremitate caudali subulata, papilla suctoria subclavatum. *Caput* corpore continuum, truncatum. *Os* terminale, orbiculare, cirrhatum. *Ocelli* nulli. *Penis* simplex, nec vaginatus; apertura genitalis feminea . . . . . Aquarum dulcium et maris incola; natatoria."

1. A. serpentulus, Hemprich and Ehrenberg.

Spalanzani, Microsc. 189, figs. 2 et 12.—Fränkische Samml. iv. 227, figs. *b–f*.

Enchelis, Hill, Hist. Anim. tab. i. (ic. mediocris).

Vibrio serpentulus, Müller, Verm. Terr. et Fluv. 24.—Ejus Zool. Dan. Prodr. 2449, et ejus Anim. Infus. 61, tab. viii. 15.—Bory, in Encyl. Méth. 1824, 777, tab. iv. 10.—Blainville, in Dict. des Sc. Nat. lvii. 537, et lviii. 69.

Amblyura Serpentulus, Hemprich et Ehrenberg, Symb. Phys. Phytoz. Entoz. tab. ii. 14 (omissis cirrhis).—Ehrenberg, Infusionsth. 82.—Lamarck, Anim. sans Vert. 2nde édit. iii. 663.—Dujardin, Hist. Nat. des Helminthes, 237.

Anguillula longicauda, Leidy, in Proc. Acad. Philad. v. (1851) 225.

Amblyura serpentulus?, Leidy, ibid. viii. (1854) 49.

"*Cauda* elongata, clavata. Longit. $\frac{1}{8}'''$."

"*Hab.* In infusione vegetabili plurium septimanarum et in palustribus, in Dania raro (*Müller*). In montibus Sinaiticis cum Confervis e rivulo vallis Wadi Esle prope Tor, et Berolini (*Ehrenberg*). Inter fila *Lyngbyæ muralis* aliarumque Confervarum in aquæductu, Philadelphiæ (*Leidy*[1])."

Nota. "De *Amblyura Serpentulo* Berolinensi præterea sequentia valent:—Corpus subtilissime, transverse striolatum, subannulatum. Tubus cibarius hinc ore, illinc ano terminatus simplex, strictura cardiaca insignis. Os terminale, anus ad caudæ basin lateralis. Feminarum apertura genitalis in medio corpore. Uterus bicornis. Feminæ maribus majores."—*Hemprich* et *Ehrenberg*.

2. A. Gordius, Hemprich et Ehrenberg.

Vibrio Gordius, Müller, Anim. Infus. 60, tab. viii. 13, 14.

Amblyura Gordius, Hemprich et Ehrenberg, Symb. Phys. Phytoz. Entoz.—Ehrenberg, Insfusionsth. 82.—Lamarck, Anim. sans Vert. 2nde édit. iii. 663.—Dujardin, Hist. Nat. des Helminthes, 238.

Enoplus elongatus, Dujardin?, Hist. Nat. des Helminthes, 238.

[1] Dr. Leidy's description, collected from the two notices, is as follows:—

"*Amblyura serpentulus.*—Body cylindrical, colourless, hyaline; anteriorly obtusely rounded; posteriorly attenuated, with a long, delicate, flexible, subulate tail; suctorial disk exceedingly minute, clavate. Mouth with cirri; œsophagus cylindrical, often with the appearance of a globular bulb at its lower end; intestines cylindrical. Anus indistinct. Generative apparatus?

"Length of largest $\frac{1}{40}''$; breadth $\frac{1}{1000}''$; length of tail $\frac{1}{2000}''$. Smallest, length $\frac{1}{160}''$; breadth $\frac{1}{2000}''$; length of tail $\frac{1}{800}''$. In an individual $\frac{1}{100}''$ long, the œosophagus measured $\frac{1}{5700}''$ long.

"*Hab.* Found under *Lyngbya muralis* and other Confervæ about gutters and water-spouts in the City of Philadelphia. This species is very active in its movements, and appears to have the power of fixing itself by the end of the tail to surrounding objects."

"*Cauda* brevis, globifera. Longit. . . . . ."

"*Hab.* In infuso marino (*O. F. Müller, Ehrenberg*)."

3. A. MUCRONATA, Diesing[1].

Czernay, in Bullet. de Moscou, xxvi. (1853) 205 (cum icone xylogr.).

"*Os* cirrhis brevibus quatuor cinctum. *Cauda* papilla suctoria subglobosa mucrone brevi aucta. Longit. fem. ad $\frac{3}{4}'''$.

"*Hab.* Prope Charkoviam."—*Czernay.*

32. HEMIPSILUS, Quatrefages.

GEN. CHAR. "*Corpore* fere cylindrico; *cauda* acuta, nuda; *capite* truncato, rotundato, setis circumdato; parte anteriore corporis setarum paribus lateralium retro decrescentium armata."

1. H. ——, Quatrefages.

Ann. des Sc. Nat. 3e sér. tom. vi. (1846) p. 131.

"Un peu obtus en avant, le corps se renfle très-légèrement dans son milieu, et se termine en pointe aiguë. Près de l'extrémité antérieure se trouvent six soies placées en cercle d'une manière symétrique autour du corps . . . . . .

"La trompe est forte et musculeuse; elle occupe environ le quart de la cavité du corps. Au point où se joignent la trompe et l'intestin, on trouve quatre corps glandulaires qui semblent déboucher dans l'œsophage.

"L'appareil genital s'ouvre à peu près vers le milieu du corps. La verge est formée par un spicule unique recourbé. À sa base sont quatre poches à parois épaisses, deux grandes et deux petites; des muscles très-apparents servent à le mouvoir."

2. H. TRICHODES, Leuckart.

Leuckart, Archiv für Naturgeschichte, 1849, Band i. p. 157.
Eberth, Untersuch. über Nemat. p. 16.

3. H. AMPHACANTHUS, Grube.

Grube, Archiv für Naturgeschichte, 1855, Jahrg. 21, Bd. i. p. 153.
Eberth, Untersuch. über Nemat. p. 17.

33. PHANOGLENE, Nordmann.

GEN. CHAR. "*Corpus* capillare, retrorsum acuminatum. *Caput* corpore continuum, truncatum. *Os* terminale, bilabiatum, cirrhis 2–4. *Ocelli* ruberrimi in cervice. *Penis* filiformis, vagina tubulosa exceptus; feminæ apertura genitalis . . . ."

"Aquarum dulcium incolæ."

1. P. BARBIGER, Nordmann.

Phanoglene barbiger, Nordmann, in Lamarck's Anim. sans Vert. 2de édit. iii. 664.—Dujardin, Hist. Nat. des Helminthes, 238.

[1] This account of the genus and species of *Amblyura* has been taken from Diesing's Syst. Helminth. vol. ii. p. 126, and his 'Revision der Nematoden," *loc. cit.* p. 624.

"*Os* cirrhis quatuor instructum. *Ocelli* duo discreti. Longit . . . ."
"*Hab.* In aqua stagnante prope Berolinum (*Nordmann*)."

2. P. MICANS, Nordmann.

Phanoglene micans, Nordmann, in Lamarck's Anim. sans Vert. 2de édit. iii. 664.—Dujardin, Hist. Nat. des Helminthes, p. 238.

"*Os* cirrhis duobus instructum. *Ocelli* coaliti. Longit . . . ."
"*Hab.* In larva Neuropteri (*Nordmann*)" [1].

In all probability, this was a mere accidental tenant of the intestine of the Neuropterous larva in which it was found by Nordmann—having been swallowed with its food. The presence of ocelli renders it almost certain that it could not be an habitual parasite; and the experiments of Davaine (Recherches sur l'Anguillule du Blé niellé, p. 64) have demonstrated that these Nematodes pass uninjured through the intestinal canal of many of the invertebrate and cold-blooded vertebrate animals.

The only freshwater genus in which I have yet met with species possessing ocelli has been *Monhystera*.

The three following marine species I am very uncertain about, and have therefore merely followed Eberth in allowing them to remain in this genus.

3. P. ROSEA, Eberth.

Lineola rosea, Kölliker, Verhandl. d. Naturforsch. Gesell. in Zürich, 1845.—Eberth, Untersuch. über Nematod. p. 18.

"Rosenrothe Farbe, Kopf dreilappig, stumpf, Mundhöhle unbewaffnet, Fühler gleich lang, an der basis der Kopflappen; seitlich an der Speiseröhre zwei braune viereckige Flecken."—*Eberth*.

4. P. OBTUSICAUDATA, Eberth.

Lineola obtusicaudata, Kölliker, Verhandl. d. Naturf. Gesell. in Zürich, 1845.—Eberth, Untersuch. über Nematod. p. 18.

"Kopf noch stumpfer, und die braune Flecken noch einmal so gross, von 0·066‴, Fühler sehr kurz, 0·001–0·0013‴ lang, vier fast ganz vorn, zwei etwas weiter hinten, alle mit dicker in der haut steckender Basis, Schwanz stumpf, kurz, 0·0033″ lang. Penis sehr kurz, von 0·015‴.—*Eberth*.

5. P. FLUSTRÆ, Eberth.

Eberth, Untersuch. über Nematod. p. 18.

Ascaris Flustræ, Dalyell, 'The Powers of the Creator displayed in the Creation,' vol. ii. 1853, p. 92, pl. x. fig. 27.—Leuckart, Archiv für Naturges. 1859, Jahrg. 25, Bd. ii. S. 101 u. 146.

"Length half a line; body slender, nearly cylindrical; extremities acute. Colour dark grey or brownish, with a darker line in the centre of the anterior extremity, denoting an internal organ. Two very conspicuous black specks, resembling eyes, are seated just at the origin of the anterior pellucid part.

[1] The account of this genus, so far, has been taken from Diesing's 'Syst. Helminth.' p. 128.

"Some of these animals appeared among a number of the decaying corpuscula from the *Flustra carbasea*, which they frequently penetrated as if in quest of food."—*Dalyell.*

34. PONTONEMA, Leidy.

Proceed. of Acad. of Philad. vol. viii. (1856) p. 49.

GEN. CHAR. "Body capillary, narrowing towards the extremities. Head continuous with the body, truncated or obtuse, and surmounted with angular papillæ, cirrated. Eyes none. Tail obtuse. Generative aperture ventral, near the middle of the body. Œsophagus long, cylindro-clavate; gizzard none, intestine straight, capacious; anus ventral and posterior."

1. P. VACILLATUM, Leidy.

Journ. Acad. Philad. 2nd ser. iii. 144, et in Proceed. Acad. Philad. viii. (1856) p. 49.

"Body cylindroid anteriorly, with longitudinal rows of short cirri in addition to those of the head; posteriorly incurved; tail short, thick, conical, obtuse. Length to 9 lines; breadth to $\frac{1}{5}$th of a line."

"*Hab.* Found on the sea-shore of Rhode Island, beneath stones, between tides."

2. P. MARINUM, Leidy.

Journ. Acad. Philad. 2nd ser. iii. 144, et in Proceed. Acad. Philad. viii. (1856) p. 49.

"Body cylindroid; head convex; mouth surrounded with angular papillæ. Cirri 4, at the side of the head. Tail long, narrow, conical, obtuse. Length to 3 lines."

"*Hab.* Found at the bottom of a sound on the coast of New Jersey."

3. P. MÜLLERI, Diesing.

Vibrio Anguillula d. Anguillula marina, Müller, Anim. Infus. 66, Taf. ix. 9–11.

Vibrio marina, Bory, in Encycl. Méth. (1824) 778, tab. xxiv. 26.—De Blainville, in Dict. d. Sc. Nat. lvii. 537, et lviii. 71.

Anguillula marina, Oerst. De region. marin. 1844, 63 & 69.

Enchelidium marinum, Ehrenb.—Diesing, Syst. Helm. i. 127 (partim).

"*Corpus* subæquale, retrorsum acutatum. *Caput* truncatum. *Os* cirrhis .... Longit. ad 1‴."

"*Hab.* Inter mucosa palos marinos obvestientia, et in aqua marina servata frequentissime (*O. F. Müller*). In profunditate 0–8 orgyiarum, æstate, in fretu Oeresund (*Oersted*)."

"Cum *Vibrio marina*, Müller, ocellis omnino destituta sit, cum *Enchelidio marino*, Ehrenberg, identica esse non potest (*Oersted*, l. c.)."—Sitzungsb. der Kais. Akad. 1861, (Bd. xlii.) S. 623.

35. POTAMONEMA, Leidy.

Proceed. of Acad. of Philad. viii. (1856) 49.

GEN. CHAR. "Body filiform, narrowing towards the extremities. Head continuous with the body, slightly dilated, obtuse. Mouth large, infundibuliform, unarmed. Œsophagus narrow, flexuous, membranous, gradually expanding into a capacious, straight,

cylindrical intestine; anus none (?) or exceedingly indistinct. Caudal extremity obtuse. Generative aperture of the female near the middle of the body."

P. NITIDUM, Leidy.

"Body cylindroid, most narrowed anteriorly. Head without appendages. Caudal extremity broad, obtusely conical. Length 5 lines; breadth $\frac{1}{5}$th of a line."

"An active, wriggling, glistening-white worm, found among beds of *Vallisneria americana* growing in the river Schuylkill, near Philadelphia."

36. NEMA, Leidy.

Proceed. of Acad. of Philad. viii. (1856) 49.

GEN. CHAR. "Body ascaridiform. Head without appendages. Mouth unarmed, large, infundibuliform; œsophagus tubular, membranous, expanding into a simple, straight intestine; anus ventral. Tail conical, acute, recurved. Generative aperture near the middle of the body."

N. VACILLANS, Leidy.

"Body white, glistening. Length $1\frac{1}{2}^{mm}$; breadth $\cdot 050^{mm}$. Tail $\cdot 115^{mm}$ long."

"An active, wriggling worm, found about some dead specimens of a black *Phryganea*, which was infested with a fungous parasite, and attached to stones at the water's edge of a small brook near Philadelphia."

37. UROLABES, Carter.

"The generic name of *Urolabes*, which I have employed, should only be viewed as provisional. It has been chosen from the striking habit which all these worms have of attaching themselves to some object by the tail, whether it be by embracing it or by adhering to its surface. Hence the tail would appear to be both prehensile and adhesive, if not suctorial. Having once fixed themselves in this way, they keep up an undulating movement from the tail forwards, which, in the absence of any evident purpose, seems more for respiration than anything else."—*Ann. of Nat. Hist.* ser. iii. vol. iv. p. 99.

Amongst the ten species described by Carter, there are representatives of several genera; and I have been able to assign positions to three of the species—one in the genus *Dorylaimus*, one in *Chromadora*, and one in *Symplocostoma*. Of the remainder, three (*U. glœocapsarum*, *U. labiata*, and *U. tentaculata*) seem, by the form of their œsophagus, almost to belong to the genus *Rhabditis*, although this is somewhat negatived by the absence of caudal alæ in the male of *U. glœocapsarum*, the males of the other two species not having been discovered.

1. U. GLŒOCAPSARUM, Carter.

Loc. cit. p. 40, pl. iii. fig. 25.

"*Female*, linear, cylindrical, striated transversely, gradually diminishing towards the head, which is obtuse and without papillæ; also towards the tail, which is long and furnished with a digital termination. Vulva a little anterior to the middle of the body."

"Œsophagus commencing with a cup-like buccal cavity, from which a narrow straight tube extends back to the intestine. Intestine much larger than œsophagus. Muscular sheath of œsophagus commencing a little distance from the buccal dilatation, leaving a portion of œsophagus naked, and then having two swellings in its course, one oval and the other terminal and bulbous. Hepatic organ consisting of a layer of brownish oil-globules, occupying the interval between the intestine and its sheath throughout."

"Organs of generation double, occupying middle third of body."

"*Size*, $\frac{1}{54}''$ long, and $\frac{1}{376}''$ broad."

"*Male*, somewhat smaller than the female; tail somewhat shorter and thicker."

"*Hab.* The *Glœocapsa* which grows on walls and on the sides of gutters during the 'rains,' Island of Bombay."

2. U. LABIATA, Carter.

Loc. cit. p. 41, pl. iii. fig. 26.

"*Female*, linear, cylindrical, unstriated, gradually diminishing towards the head, which is labiated and furnished with two papillæ; also towards the tail, which is conical and elongated. Vulva much behind the centre of the body, about the point of union of the posterior two quarters."

"Alimentary canal and œsophageal and intestinal sheaths, with hepatic organ, the same as in the foregoing species; but no buccal dilatation. Organs of generation probably unsymmetrical, from backward position of vulva."

"*Size*, about $\frac{1}{40}''$ long, and $\frac{1}{774}''$ broad."

"*Male*, unseen."

"*Hab.* The *Glœocapsa* of the walls, &c., during the 'rains,' Island of Bombay."

3. U. TENTACULATA, Carter.

Loc. cit. p. 41, pl. iii. fig. 27.

"*Female*, linear, cylindrical, unstriated, gradually diminishing towards the head, which is obtuse and furnished with two short, thick, conical tentacular prolongations closely approximated at their base and turned outwards; also diminishing gradually towards the tail, which is conical and elongated. Vulva just behind the middle of the body."

"Alimentary canal and hepatic organ much the same as in the two preceding species, but having no buccal dilatation. Organs of generation double, occupying the central portion of the body; their form undetermined."

"*Size*, about $\frac{1}{23}''$ long, and $\frac{1}{26}''$ [?] broad."

"*Male*, unseen."

"*Hab.* The same as the two preceding species."

4. U. CIRRATA, Carter.

Loc. cit. p. 41, pl. iii. fig. 28.

"*Female*, linear, cylindrical, unstriated, gradually diminishing towards the head, which is obtuse and furnished with two linear, short cirri, widely separated; also diminishing

gradually towards the tail, which is somewhat curved and obtuse at the extremity. Vulva considerably posterior to the middle of body."

"Alimentary canal the same as in the foregoing species, but without buccal dilatation. Organs of generation undetermined."

"*Size* $\frac{1}{73}''$ long, and $\frac{1}{1080}''$ broad."

"*Male*, unseen."

"*Hab.* Same as foregoing."

5. U. PARASITICA, Carter.

Loc. cit. p. 44, et vol. ii. pl. iv. fig. 50.

"*Female*, linear, cylindrical, unstriated; gradually diminishing towards the head, which is obtuse and without papillæ, and also towards the tail, which is long and conical. Vulva a little in front of the middle of the body."

"Œsophagus commencing in an expanded oral orifice, immediately becoming narrowed into a straight, uniform tube, naked at the commencement, but soon surrounded by a sheath, which goes on increasing in width to the point of union of the œsophagus and intestine, after which it continues of uniform calibre to the termination of the latter. Organs of generation double, occupying the middle third of body."

"*Size*, $\frac{1}{43}''$ long."

"*Male*, unseen."

"*Hab.* Peritoneal cavity[1] of *Nais albida*; in more or less abundance during the 'rains,' when this *Nais* makes its appearance in the *Glœocapsa* mentioned, Island of Bombay.

6. U. ERYTHROPS, Carter.

Loc. cit. p. 42, pl. iii. fig. 29.

"*Female*, linear, cylindrical, minutely striated transversely, ocellated; gradually diminishing towards the head, which is obtuse and without papillæ, also towards the tail, which is long and conical. Vulva just about the middle of body. Œsophagus commencing with a cup-like followed by a globular dilatation, after which it becomes narrow, uniform in width, and pursues a straight course back to the intestine. Intestinal sheath presenting a constriction just after its commencement, which gives it a globular form, part of which only is lined with the hepatic organ. Organs of generation double, occupying the middle third of the body."

"*Ocelli* consisting of two globular bodies, situated a short distance from the head, and between (?) the peritoneal and muscular sheaths of the œsophagus, opake, of a rich carmine colour in their posterior three-fourths, and the anterior fourth or corneal portion bluish opalescent."

"*Size* $\frac{1}{20}''$ long, and $\frac{1}{470}''$ broad."

"*Male*, the same as the female, but with the posterior part of the body terminating more abruptly, and the tail more attenuated."

"*Hab.* Silty clots of *Oscillatoria* floating in the salt-water main drain of the town of Bombay."

[1] Vide note, p. 77 of this Memoir.

7. U. INFREQUENS, Carter.

Loc. cit. p. 43, pl. iii. fig. 30.

"*Female*, the same as the foregoing species, but a little larger in every way."

"Alimentary canal and organs of generation the same generally. Ova undergoing segmentation; and the embryo developed in the ovisac, but not liberated there."

"*Ocelli*, the same in situation, but semi-opake and of a yellowish colour throughout."

"*Size*, undetermined."

"*Male*. Same as the female, but with a short curved tail, presenting on each side of the inner curvature a membranous expansion supported on setaceous ribs, which extends from the tip of the tail to some little distance above the anus. Organs of generation the same as in the foregoing species; form of testis undetermined."

"*Hab*. The same as last."

Note appended on June 17, 1865.—Whilst this memoir has been going through the press, I have completely satisfied myself of the general correctness of Schneider's views (Reich. and Du Bois-Reym. Archiv, 1863) regarding the nature and arrangement of the nervous system in *Ascaris megalocephala*; and in another memoir, laid before the Royal Society of London on the 15th of this month ("On the Anatomy and Physiology of the Nematoids, Parasitic and Free; with observations on their Zoological Position and Affinities to the Echinoderms"), I have described and figured this system as it exists in *A. lumbricoides*, *A. osculata*, and *A. marginata*. The arrangement which has now been recognized in these and other species, either by Schneider or myself, will, I believe, prove to be the typical condition of the nervous system in the Nematoids generally, although the difficulty of actually demonstrating it is often extreme. I am still of opinion, however, that the so-called "œsophageal ring" met with occasionally in both free and parasitic species is not to be considered a portion of the nervous system of these animals. Reasons for this belief, as well as many new facts and views concerning the anatomy of this interesting group of animals, are contained in my last memoir above mentioned.

ERRATA.

Page 73, [1] omitted before first footnote.
„ 78, note, line 12, *instead of* par *read* pas.
„ 82, line 22, *instead of* (Schwanzdrüsefi) *read* (Schwanzdrüsen).
„ 82, line 31, instead of *Tylelenchus* read *Tylenchus*; and the same in pp. 83 (twice), 84 (twice), 85, 89, 94, 96 (four times), 110, 113.
„ 93, *instead of* 7. TRIPULA *read* 7. TRIPYLA.
„ 94, *instead of* [c] 21. LINHOMOMIUS *read* [c] 21. LINHOMŒUS.
„ 148, line 27, *instead of* 166 *read* 167.
„ 165, line 15, *instead of* SPILIPHERA *read* SPILOPHORA.

FREE NEMATOIDS.

EXPLANATION OF PLATES.

The same letters refer to similar parts in all the figures.

a. Mouth.
b. Pharynx.
b'. Pharyngeal teeth.
b''. Pharyngeal processes.
c. Œsophagus.
c'. Median swelling of same.
c''. Terminal swelling of same.
c'''. Valvular apparatus of latter.
d. Intestine.
d'. Hepatic cells.
e. Anus.
e'. Anal glands.
f. Vulva.
f'. Vaginal glands.
g. Male spicules.
g' Accessory pieces.
h. Seminal tube.
i. Supplementary male organ.
k. Abdominal gland.
k'. Excretory orifice of same.
l. Floating gland-cells.
m. Œsophageal ring.
n. Ocellus.
o. Lateral canals.
p. Integument.
p'. Cervical markings of same.
q. Cephalic papillæ.
r. Caudal sucker.
r'. Sucker-tubes.
s. Genital papillæ or suckers.
t. Caudal ala of male.
t'. Rays supporting same.
u. Ovum.
v. Sperm-cell.

Most of the figures are representations of the object drawn to a scale of 150 : 1, *i. e.* are representations magnified 150 diameters—the exceptions being figs. 126–128 and figs. 151–177, all of which are only magnified 100 diameters.

Unless stated to the contrary, the drawings represent the anterior and posterior extremities from a lateral aspect—the animal lying on its side.

Where transverse integumental striæ exist, they are only *represented* on the anterior extremity.

LAND AND FRESHWATER*.

Plate IX.

Figs.

1. *Monhystera dispar*, n. sp.; anterior extremity of female.
2. Posterior extremity of female.
3. *Monhystera rivularis*, n. sp.; anterior extremity of male.
4. Posterior extremity of male.
5. *Monhystera longicaudata*, n. sp.; anterior extremity of female.
6. Posterior extremity of female.
7. *Monhystera filiformis*, n. sp.; anterior extremity of female.
8. Posterior extremity of female.
9. *Monhystera stagnalis*, n. sp.; anterior extremity of female.
10. Posterior extremity of female.
11. Posterior extremity of male.
12. *Monhystera disjuncta*, n. sp.; anterior extremity of male.
13. Posterior extremity of male.
14. *Monhystera ambigua*, n. sp.; anterior extremity of male.
15. Posterior extremity of male.
16. *Tripyla glomerans*, n. sp.; anterior extremity of male.
17. Posterior extremity of male.
18. *Tripyla salsa*, n. sp.; anterior extremity of female.
19. Posterior extremity of female.
20. *Trilobus gracilis*, n. sp.; anterior extremity of female.
21. Posterior extremity of female.
22. Posterior extremity of male.
23. *Trilobus pellucidus*, n. sp.; anterior extremity of female.
24. Posterior extremity of female.
25. *Mononchus truncatus*, n. sp.; anterior extremity of female.
26. Posterior extremity of female.
27. *Mononchus papillatus*, n. sp.; anterior extremity of female.
28. Posterior extremity of female.
29. *Mononchus macrostoma*, n. sp.; anterior extremity of female.
30. Posterior extremity of female.
31. *Mononchus tunbridgensis*, n. sp.; anterior extremity of female.
32. Posterior extremity of female.
33. *Mononchus cristatus*, n. sp.; anterior extremity of female.
34. Posterior extremity of female.

34*a*. *Ironus ignavus*, n. sp.; anterior extremity of female.

34*b*. Posterior extremity of female.

35. *Dorylaimus stagnalis*, Dujardin; anterior extremity of female.
36. Posterior extremity of female.
37. Posterior extremity of male.
38. *Dorylaimus Carteri*, n. sp.; anterior extremity of female.
39. Posterior extremity of female.
40. Posterior extremity of male.
41. *Dorylaimus obtusicaudatus*, n. sp.; anterior extremity of female.
42. Posterior extremity of female.
43. *Dorylaimus tenuicaudatus*, n. sp., anterior extremity of female.
44. Posterior extremity of female.

* *M. disjuncta* and *M. ambigua*, and also *Rhabditis marina*, are marine.

Plate X.

Figs.

45. *Dorylaimus tritici*, n. sp.; anterior extremity of female.
46. Posterior extremity of female.
47. Posterior extremity of male.
48. *Dorylaimus filiformis*, n. sp.; anterior extremity of female.
49. Posterior extremity of female.
50. *Dorylaimus polyblastus*, n. sp.; anterior extremity of male.
51. Posterior extremity of male.
52. *Dorylaimus papillatus*, n. sp.; anterior extremity of female.
53. Posterior extremity of female.
54. *Dorylaimus torpidus*, n. sp.; anterior extremity of female.
55. Posterior extremity of female.
56. Posterior extremity of male.
57. *Dorylaimus iners*, n. sp.; anterior extremity of female.
58. Posterior extremity of female.
59. Posterior extremity of male.
59*a*. *Anguillula aceti*, Ehrenb.; anterior extremity of female.
59*b*. Posterior extremity of female.
59*c*. Posterior extremity of male.
60. *Rhabditis marina*, n. sp.; anterior extremity of female.
61. Posterior extremity of female.
62. Posterior extremity of male.
63. *Rhabditis longicaudata*, n. sp.; anterior extremity of female.
64. Posterior extremity of female.
65. *Rhabditis ornata*, n. sp.; anterior extremity of female.
66. Posterior extremity of female.
67. Posterior extremity of male, ventral aspect.
68. *Rhabditis acris*, n. sp.; anterior extremity of female.
69. Posterior extremity of female.
70. Posterior extremity of male.
71. *Diplogaster fictor*, n. sp.; anterior extremity of female.
72. Posterior extremity of female.
73. Posterior extremity of male.
74. *Diplogaster albus*, n. sp.; anterior extremity of female.
75. Posterior extremity of female.
76. *Diplogaster filiformis*, n. sp.; anterior extremity of female.
77. Posterior extremity of female.
78. Posterior extremity of male.
79. *Plectus parietinus*, n. sp.; anterior extremity of female.
80. Posterior extremity of female.
81. *Plectus cirratus*, n. sp.; anterior extremity of female.
82. Posterior extremity of female.

Figs.

83. *Plectus tenuis*, n. sp.; anterior extremity of female.
84. Posterior extremity of female.
85. *Plectus velox*, n. sp.; anterior extremity of female.
86. Posterior extremity of female.
87. *Plectus acuminatus*, n. sp.; anterior extremity of female.
88. Posterior extremity of female.
89. *Plectus parvus*, n. sp.; anterior extremity of female.
90. Posterior extremity of female.
91. *Plectus tritici*, n. sp.; anterior extremity of female.
92. Posterior extremity of female.
93. *Plectus granulosus*, n. sp.; anterior extremity of female.
94. Posterior extremity of female.
95. *Plectus fusiformis*, n. sp.; anterior extremity of female.
96. Posterior extremity of female.
97. *Aphelenchus avenæ*, n. sp.; anterior extremity of female.
98. Posterior extremity of female.
99. *Aphelenchus villosus*, n. sp.; anterior extremity of female.
100. Posterior extremity of female.
101. Posterior extremity of male.
102. *Aphelenchus parietinus*, n. sp.; anterior extremity of female.
103. Posterior extremity of female.
103*a*. *Aphelenchus pyri*, n. sp.; anterior extremity of female.
103*b*. Posterior extremity of female.
103*c*. Posterior extremity of male.
104. *Cephalobus persegnis*, n. sp.; anterior extremity of female.
105. Posterior extremity of female.
106. Posterior extremity of male.
107. *Cephalobus striatus*, n. sp.; anterior extremity of female.
108. Posterior extremity of female.
109. *Tylenchus Davainii*, n. sp.; anterior extremity of female.
110. Posterior extremity of female.
111. Posterior extremity of male.
112. *Tylenchus* (*Vibrio*) *tritici*, anterior extremity of female.
113. Posterior extremity of female.
114. Posterior extremity of male.
115. *Tylenchus terricola*, n. sp.; anterior extremity of female.
116. Posterior extremity of female.
117. *Tylenchus obtusus*, n. sp.; anterior extremity of female.
118. Posterior extremity of female.
118*a*. Posterior extremity of male.

MARINE SPECIES.

Plate XI.

Figs.

119. *Symplocostoma longicollis*, n. sp.; anterior extremity of female.
120. Posterior extremity of female.
121. Posterior extremity of male.
122. Ventral aspect of anterior extremity, showing buccal apparatus more highly magnified.
123. *Symplocostoma vivipara*, n. sp.; anterior extremity of female.
124. Posterior extremity of female.
125. Posterior extremity of male.
126. *Oncholaimus vulgaris*, n. sp.; anterior extremity of female, showing pigmentary markings of anterior portion of œsophagus only.
127. Posterior extremity of female.
128. Posterior extremity of male.
128*a*. Accessory piece, more highly magnified.
129. *Oncholaimus glaber*, n. sp.; anterior extremity of female.
130. Posterior extremity of female.
131. *Oncholaimus viscosus*, n. sp.; anterior extremity of female, with adherent fragments of sand and Diatomaceæ.
132. Posterior extremity of female.
133. Posterior extremity of male.
134. *Oncholaimus attenuatus*, Dujard.; anterior extremity of female.
135. Posterior extremity of female.
136. Posterior extremity of male.
137. *Oncholaimus viridis*, n. sp.; anterior extremity of female.
138. Posterior extremity of female.
139. *Oncholaimus fuscus*, n. sp.; anterior extremity of male.
140. Posterior extremity of male.
141. *Oncholaimus albidus*, n. sp.; anterior extremity of female.
142. Posterior extremity of female.
143. *Anticoma Eberthi*, n. sp.; anterior extremity of female.
144. Posterior extremity of female.
145. Posterior extremity of male.
146. *Anticoma limalis*, n. sp.; anterior extremity of female.
147. Middle portion of body, showing vagina and vaginal glands.
148. Posterior extremity of female.
149. *Anticoma pellucida*, n. sp.; anterior extremity of female.
150. Posterior extremity of female.
151. *Phanoderma Cocksi*, n. sp.; anterior extremity of female.
152. Posterior extremity of female.
153. Posterior extremity of male.
154. *Phanoderma albidum*, n. sp.; anterior extremity of female, dorsal aspect.
155. Posterior extremity of female.

Plate XII.

Figs.

156. *Leptosomatum elongatum*, n. sp.; anterior extremity of male, dorsal aspect.
157. Posterior extremity of male.
158. *Leptosomatum gracile*, n. sp.; anterior extremity of female, dorsal aspect.
159. Posterior extremity of female.
160. Posterior extremity of male.
161. *Leptosomatum figuratum*, n. sp.; anterior extremity of female, dorsal aspect.
162. Posterior extremity of female.
163. Posterior extremity of male.
164. *Enoplus communis*, n. sp.; anterior extremity of female[1].
165. Posterior extremity of female.
166. Posterior extremity of male.
167. The three teeth more highly magnified.
168. *Enoplus Dujardinii*, n. sp.; anterior extremity of female.
169. Posterior extremity of female.
170. Posterior extremity of male.
171. *Enoplus pigmentosus*, n. sp.; anterior extremity of female.
172. Posterior extremity of female.
173. *Enoplus inermis*, n. sp.; anterior extremity of female, dorsal aspect.
174. Posterior extremity of female.
175. Posterior extremity of male.
176. *Enoplus brevis*, n. sp.; anterior extremity of female.
177. Posterior extremity of female.
178. *Linhomœus hirsutus*, n. sp.; anterior extremity of female.
179. Posterior extremity of female.
180. *Linhomœus elongatus*, n. sp.; anterior extremity of male.
181. Posterior extremity of male.

[1] In the members of this genus, the pigmentary markings of the anterior portion of the œsophagus only are represented.

Plate XIII.

Figs.

182. *Tachyhodites natans*, n. sp.; anterior extremity of female.
183. Posterior extremity of female.
184 Posterior extremity of male.
185. *Tachyhodites parvus*, n. sp.; anterior extremity of female.
186. Posterior extremity of female.
187. *Theristus acer*, n. sp.; anterior extremity of male.
187*a*. Anterior extremity seen from above, showing lateral convex projections of integument.
188. Posterior extremity of male.
189. *Theristus velox*, n. sp.; anterior extremity of female.
190. Portion of body, showing vagina and unequal vaginal glands.
191. Posterior extremity of female.
192. *Sphærolaimus hirsutus*, n. sp.; anterior extremity of female.
193. Posterior extremity of female.
194. Posterior extremity of male.
194*a*. Single-grooved accessory piece.
195. *Comesoma vulgaris*, n. sp.; anterior extremity of female.
196. Posterior extremity of female.
197. Posterior extremity of male.
198. *Comesoma profundi*, n. sp.; anterior extremity of female.
199. Posterior extremity of female.
200. Posterior extremity of male.
201. *Spira parasitifera*, n. sp.; anterior extremity of female.
202. Posterior extremity of female.
203. Posterior extremity of male.
204. *Spira lævis*, n. sp.; anterior extremity of female.
205. Posterior extremity of female.
206. Posterior extremity of male.
207. *Spira tenuicaudata*, n. sp.; anterior extremity of female.
207*a*. Lateral aspect of portion of anterior extremity, seen from above.
208. Posterior extremity of female.
209. Posterior extremity of male.
210. *Cyatholaimus ocellatus*, n. sp.; anterior extremity of female.
211. Posterior extremity of female.
212. Posterior extremity of male.
212*a*. Spicules and accessory pieces.
213. *Cyatholaimus cæcus*, n. sp.; anterior extremity of female.
214. Posterior extremity of female.
215. *Cyatholaimus ornatus*, n. sp.; anterior extremity of female.

Figs.

216. Posterior extremity of female.
217. *Cyatholaimus punctatus*, n. sp.; anterior extremity of male.
218. Posterior extremity of male.
219. *Cyatholaimus striatus*, n. sp.; anterior extremity of male.
220. Posterior extremity of male.
221. *Spilophora elegans*, n. sp.; anterior extremity of male.
222. Posterior extremity of male.
223. *Spilophora inæqualis*, n. sp.; anterior extremity of female.
224. Posterior extremity of female.
225. Posterior extremity of male.
226. *Spilophora robusta*, n. sp.; anterior extremity of female.
226*a*. Lateral spiral cervical marking of integument.
227. Posterior extremity of female.
228. *Spilophora costata*, n. sp.; anterior extremity of male.
229. Posterior extremity of male, showing also gradual fading of longitudinal markings.
230. *Chromadora nudicapitata*, n. sp.; anterior extremity of male.
230*a*. Three conical pharyngeal plates.
231. Posterior extremity of male.
231*a*. Portion of body, seen from ventral aspect, showing spicules and median integumental markings.
232. Posterior extremity of female.
233. *Chromadora vulgaris*, n. sp.; anterior extremity of female.
234. Posterior extremity of female.
235. Posterior extremity of male.
236. *Chromadora natans*, n. sp.; anterior extremity of male.
237. Posterior extremity of male, ventral aspect.
238. Posterior extremity of female.
239. *Chromadora cæca*, n. sp.; anterior extremity of female.
240. Posterior extremity of female.
241. Posterior extremity of male.
242. *Chromadora filiformis*, n. sp.; anterior extremity of female.
243. Posterior extremity of female.
244. Posterior extremity of male.
245. *Chromadora sabelloides*, n. sp.; anterior extremity of male.
246. Posterior extremity of male.
247. *Chromadora papillata*, n. sp.; anterior extremity of male.
248. Posterior extremity of male.

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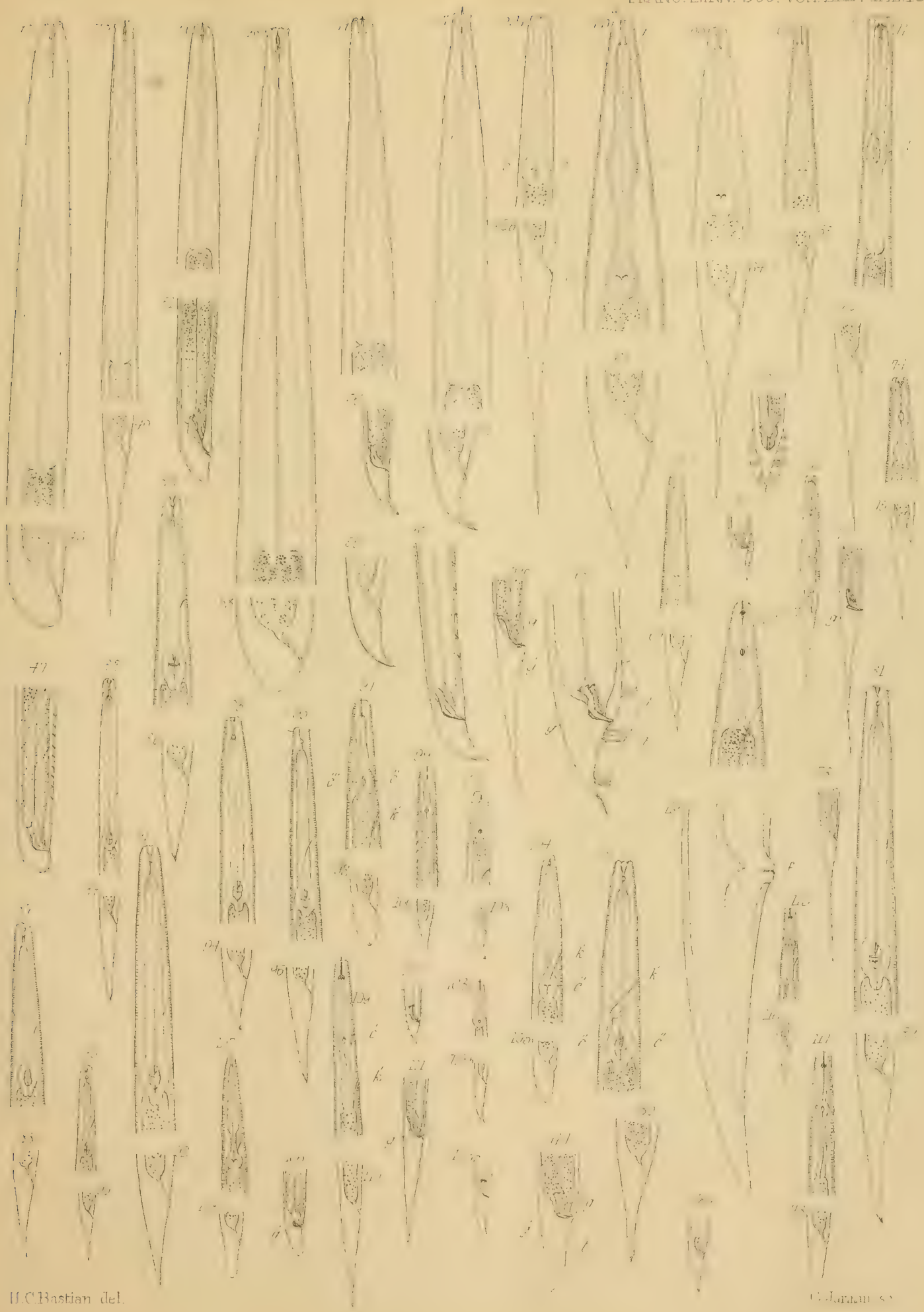

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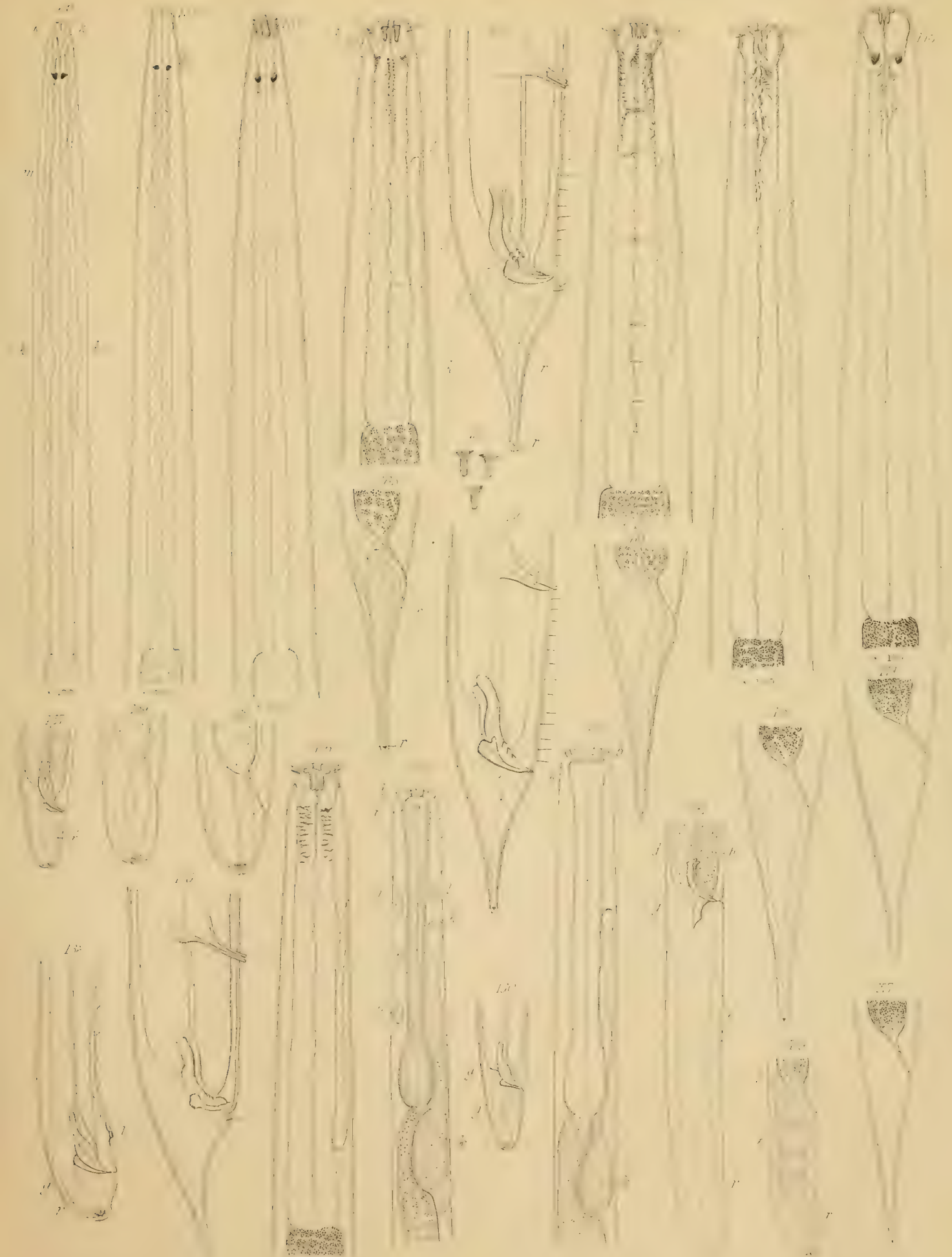

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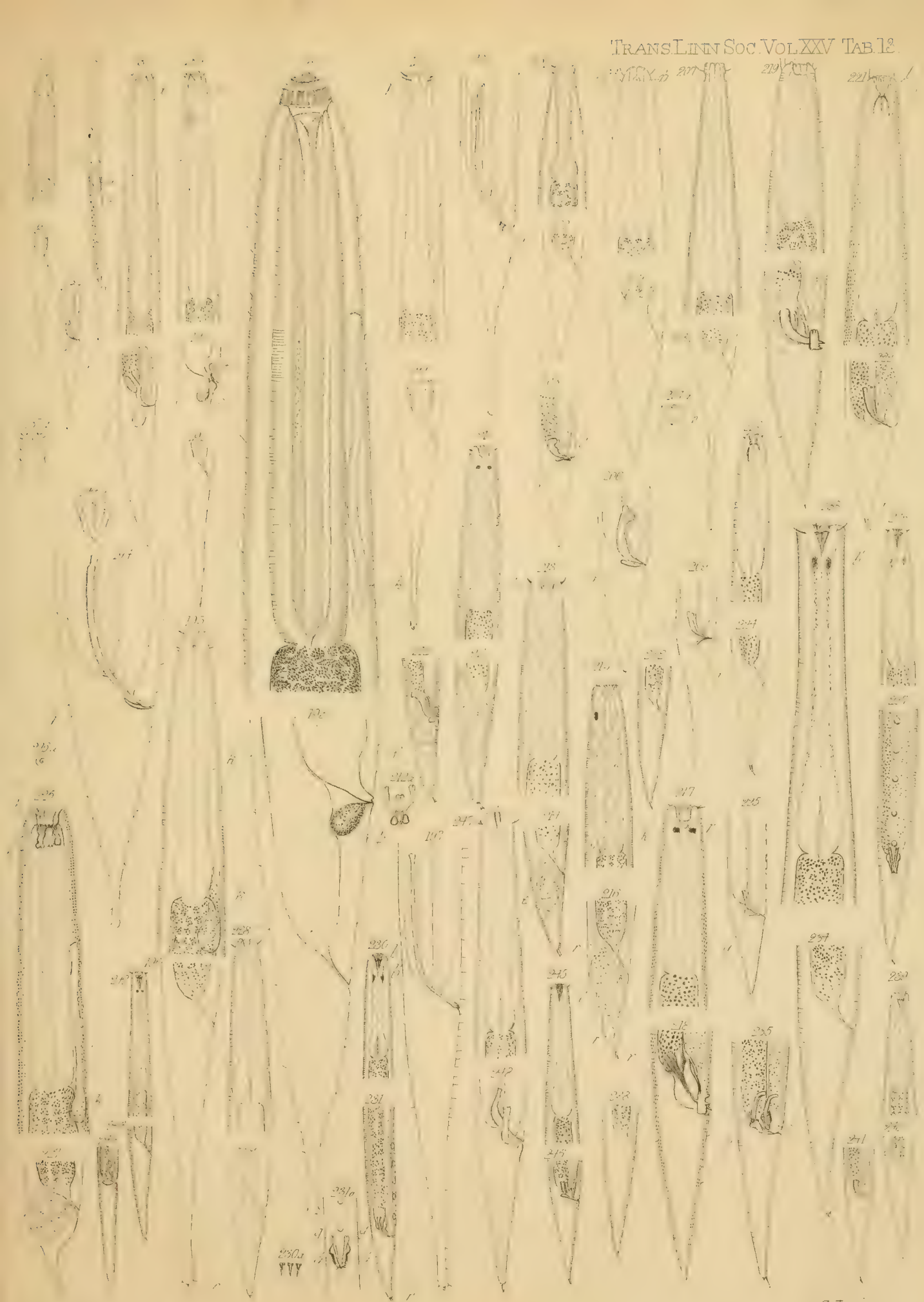

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